MARCH, 1942

Orthodontics

Office of the Editor: 8022 Forsythe Boulevard, St. Louis
Published by The C. V. Mosby Company, St. Louis

American Journal of Orthodontics and Oral Surgery

VOL. 28 MARCH, 1942 No. 3

Original Articles

PRESIDENT'S ADDRESS

GREAT LAKES SOCIETY OF ORTHODONTISTS

FRANK S. CARTWRIGHT, D.D.S., M.S., DETROIT, MICH.

SINCE the formation of the Great Lakes Society of Orthodontists back in 1926, it has been an annual custom for the president to speak to you on the state of the Society, and to make recommendations for possible improvements. This is a fine tradition. Today it becomes my duty, as well as pleasure, to make a few remarks concerning the welfare of our profession.

During the fifteen years that have passed since our founding, this Society has prospered and metamorphosed from a loosely connected group into a healthy and well-organized component of The American Association of Orthodontists. The present healthy condition of our Society, with its membership of eighty-one, is a direct reflection of the fine leadership of our past presidents and the splendid cooperation of the membership as a whole.

In line with the policy which I have referred to there are several recommendations which I would like to make to the Society at this time. The first of these has reference to the new constitution adopted at our meeting in Toronto last year, which would conform with the constitution of the parent society. You will recall that this new constitution provided that two members of our Board of Censors would lose their votes on the Executive Board. It is my carefully considered opinion that this provision is harmful to the well-being of our organization. Inasmuch as these men are elected at large, to represent the membership, I believe that their voting rights should be restored. I should like, therefore, to urge the Committee on Constitution and By-Laws to take the necessary action to remedy this situation.

Our newly adopted constitution failed to provide for the election of a Public Relations Committee as well as for the election of an Associate Editor for the

Read before the fifteenth anniversary meeting of the Great Lakes Society of Orthodontists, Nov. 3, 1941, Ann Arbor, Mich.

American Journal of Orthodontics and Oral Surgery. In view of this, your president appointed men to fill these vacancies. I again urge the Committee on Constitution and By-Laws to take steps to adjust this matter properly.

Second, it has seemed to me that a history of our Great Lakes Society would make very interesting reading. I believe that now would be an ideal time to have someone record the events of the past fifteen years.

Third, I should like to emphasize the value of progressive case reports. A few years ago Doctors George R. Moore and Varney E. Barnes championed progressive case reports. These members presented a comprehensive outline of the manner in which these cases should be followed. Through some misunderstanding on the part of those exhibiting, these reports have not been entirely satisfactory to the Executive Board. It is hoped that a better method of reporting will be evolved. Doctors Charles Waldo and Edward Martinek have been appointed as a committee to serve for five years, to make a study of the situation, with the idea of properly revising these reports in order that they may become an instructive part of our programs. The value of such reports, of course, can be determined only after many years of procedure. May I suggest that a semifinal or final report be made, about five years from today, on all that group which were started under the first chairman. I feel that the report of 1946 will prove most interesting and valuable. Before we are through with these reports, every member should have made it his duty to have made some contribution.

Item four, of which I should like to speak, has to do with recent social and judicial trends in relation to medicine and dentistry. As you may know, just recently the American Medical Association was convicted by the United States government of coercive and concerted boycotting, in violation of the Sherman Anti-Trust Act. Our profession is being forced, rather slowly, to realize that in the field of dentistry, as in all other fields of human endeavor, great changes are taking place before its eyes. Dentistry may all too soon be accorded treatment similar to that handed down to the American Medical Association unless each one of us does everything in his power to render services to as many people as possible, at equitable fees, and to stay off any and all accusations that our Society of Orthodontists is a trust. Of course, in order to render services to more people, we need to have more available time—time unhampered by our school systems. The State of California has partially solved this problem. On June 9, 1939, California passed a law, the text of which reads as follows: "No absence of a pupil from school for the purpose of having dental services rendered shall be deemed an absence in computing the average daily attendance." It took four years of struggle against the opposition of the State Department of Education before this law was passed. Every component society, working with the American Association of Orthodontists, ought to work for the passage of laws in all the states, similar to the one passed in California, so that the profession can render better services at equitable fees, to more and more children.

The question of fees brings me to my fifth item of discussion. The Public Relations Committee of the American Association of Orthodontists, reporting in the September, 1941, issue of the American Journal of Orthodontics and Oral Surgery under the division of Economics, says, "The cost of producing orthodontic service is at an all time high. The number seeking orthodontic

service is substantially increasing, but the number willing to pay commensurate fees appears to be decreasing. This situation appears to be due to the public's becoming better acquainted with the benefits of orthodontic treatment. At the same time, they have conceived the idea, through the influence of propaganda in support of socialized medicine and dentistry, that dental services are too high."

If the cost of producing orthodontic services is at an all time high, it is our duty to seek to remedy the situation. Perhaps this could be done, in a large part at least, by the observation of more cases, the simplification of our mechanical apparatus, and the enrichment of our diagnostic procedure in place of wasting valuable time looking for mechanical panaceas.

About twenty-five years ago, the orthodontic profession stopped its too serious consideration of appliances as a means to successful treatment, and began to think in biologic terms. Then for a number of years cumbersome, unsightly, complicated appliances were discarded, and in their place simplified bands and wires were substituted. For some unknown reason during the past few years, there has been an unfortunate return to complicated appliances, appliances costly in material and costly in constructive and operative time. While many of these "contraptions" may impress the lay people with our mechanical skill, we ought to remember that as in art, and in all things, our supreme principle should be simplicity.

In closing I should like to thank all of the officers, committeemen, their wives, and everyone who has helped so materially in arranging this meeting. And on behalf of the Great Lakes Society of Orthodontists, I should like also to express the Society's appreciation to all essayists, clinicians, and speakers, who have given so freely of their time.

CONGENITAL SYPHILIS AND MALOCCLUSIONS OF THE TEETH

Frederick R. Stathers, D.D.S., Philadelphia, Pa.

THE importance of congenital syphilis as an etiologic factor in malocclusions depends, (1) upon the frequency of its occurrence in the general population, and (2) upon the type of dental dystrophy and the frequency with which that occurs in the congenitally syphilitic. Jeans and Cooke[1] expressed the opinion, to which most investigators agree, that syphilis is not nearly as prevalent among children as many social workers and reformers would have us believe. The higher the social and economic scale is ascended, the lower the incidence of syphilis, and although the figures available are not reliable enough for definite conclusions, it is probable that the incidence of syphilis in children of the poorer classes is less than 2 per cent, and that the proportion in the well-to-do, is under 1 per cent of the total number of infants born. Admitting that much less than 1 per cent of the children born to the well-to-do have congenital syphilis, and accepting Fournier's[3] estimate that less than one-half of the congenitally syphilitic children have hypoplasias of the teeth, our chance of encountering a typical case becomes rather small, but it remains an interesting subject and an important one to those active or associated with hospital and welfare work.

When we come to a consideration of the hypoplasias (variously designated as atrophies and erosions), it seems best to confine ourselves to those well-defined forms generally accepted as caused by, or so constantly associated with as to be considered pathognomonic of, syphilis, because in some quarters, especially by Fournier[3] and Cavallaro,[6] it is claimed that as much as 80 per cent of all hypoplasias are caused by heredo-syphilis. As this is a debatable point, it is well to limit our observations to those upon which opinions are fairly in accord. Calcification, according to the table of chronology arranged by Magitot and Legros, and accepted by Fournier,[3] Cavallaro,[6] and Stein,[4] begins in the deciduous teeth at about the seventeenth week; in the permanent teeth at about the twenty-fifth week. It is the general belief that syphilis is at its maximum of intensity during the last months of intrauterine life, and the first months immediately after birth. The teeth that could be affected are, according to this table, the first permanent molars, the incisors, and the canines, in the order given.

The almost universal absence of hypoplasias in the deciduous teeth has led some authors[5] to state unequivocally that they are not affected, while others[3, 6] assert with equal insistence that they are affected though in much less degree. Fournier[3] thought they occur at the rate of about 1 deciduous to 15 or 20 of the permanent. The reason for this is found in the theory that if the attack of syphilis occurs early or during the calcification[1, 3, 4, 6] of the deciduous teeth, the fetus rarely lives. The argument advanced that there could be no other disease

From School of Dentistry, University of Pennsylvania.
Read previously before the Southern Society of Orthodontists.

at that time that could cause hypoplasia of the teeth is considered sufficient proof that they are of syphilitic origin.

For convenience let us admit that the Hutchinson tooth and the so-called "mulberry molar" are both pathognomonic of congenital syphilis, and get those two forms well defined so that they may be recognized as different from teeth affected by some other disturbance.

In describing the Hutchinson teeth it is made clear by Hutchinson[2] himself that his tooth is limited to the maxillary first incisors, and that not only must the crescentic notch with its curved-in edge be present, but the sides must also converge in the typical "screw-driver" pattern. It is this "screw-driver" pattern that differentiates this tooth from other forms of atrophy or hypoplasias due to other disturbances, rather than the crescentic notch. While acknowledging that other forms of atrophies or hypoplasias might be present in other teeth, he insisted that they possessed no specific significance. Admitting that typical syphilitic teeth are rarely encountered, he said that "he has never met with an instance in which the teeth were strongly marked in which subsequent inquiry did not completely confirm the suspicion of hereditary syphilis." While all the investigators from Hutchinson down feel that Hutchinson teeth point only with suspicion, that suspicion has been so generally verified that these teeth assume an important diagnostic value.

In the molar group the only tooth affected is the first or 6-year molar, and I shall take the liberty of quoting the description given by Fournier and attributed to Magitot, because it is the one most generally referred to and quoted. "Here the malformation consists in a true atrophy of the cusps of the tooth. The body of the tooth for two-thirds or three-fourths of its height is in normal condition, but the upper segment, on the contrary, is lessened in all its diameters. At the first sight, one would say it was a small tooth growing out of a larger one, or better still, a stump of dentine emerging from a normal crown." This crowding together of the cusps, is explained by Karnosh,[14] as due to the fact that the prenatal enamel deposit is limited to three or four isolated cusps not far enough advanced at birth to be well united and still close together. The dwarfing then is caused by something which must have interfered with their growth at this early period. Hypoplasias of a nonsyphilitic origin of this tooth show a wider separation of the cusps, or a tooth practically normal in crown circumference, but with a flattened surface. The cusps or sharp nodes become worn off the mulberry molars with time, but the smallness of the occlusal part of the crown remains. The importance of the Hutchinson tooth and the "mulberry molar" is stressed by Jeans and Cooke,[1] who wrote: "From their almost constant association with congenital syphilis, it appears that this infection is practically the sole cause of this type of dystrophic disturbance of earliest infancy, and that it is unlikely that simple temporary inanition in early infancy would alter dental development in this manner."

Because the patients examined were being treated for interstitial keratitis, generally accepted as evidence of congenital syphilis, it is important to know what relation the eye lesion bears to the whole group in order to estimate the comparative frequency of dental lesions. While all three of the lesions which Hutchinson first observed are not always present, and while many investigators

think that the importance of the triad is overemphasized, still the presence of any one member is to be viewed with suspicion.[9] Cavallaro gives a report gathered from the works of Fournier, which showed that of a total of 605 cases of hereditary syphilis there were found:

295 cases (50 per cent) with interstitial keratitis
262 cases (43 per cent) dental dystrophies (hypoplasias, etc.)
100 cases (16 per cent) auricular lesions

It must be borne in mind that when we come to examine our patients we are dealing with a group representing, according to Fournier's estimate, only one-half, probably less, of a random lot of individuals with congenital lues, a fact which must vitally affect any attempt at statistical analysis.

Investigators writing upon the oral manifestations of syphilis have noted other anomalies of teeth and jaws which, however, do not occur with sufficient regularity to establish their significance. Whether or not they may be directly attributed to congenital lues, they are so frequently associated with other anomalies considered pathognomonic that they may well be considered as evidence.

The anomaly of most frequent occurrence aside from the hypoplasias is what is commonly spoken of as the "open-bite." Hutchinson[2] was the first to observe this condition and remarked that; "In nearly every case, there is a deficiency in the superior alveolar arch at the anterior portion, so great in some persons, that the upper and lower incisors are of considerable distance from each other when the mouth is shut." He added, that "in such cases, the notched appearance is well marked." Cavallaro[6] also emphasized the importance of the open-bite, and attributed it, as did Hutchinson, in some severe cases, to an arrested development of the premaxilla. The milder cases he thought could be due to a failure in the vertical development of the teeth, themselves, both maxillary and mandibular. While these authors failed to make specific statements as to frequency in occurrence of this condition, one would expect, from their remarks, to find an open-bite wherever notched or screw-driver incisors were present, a condition which was found pretty generally to exist in varying degree in the group we examined.

Hutchinson[2] noted that one of the most common occurrences was that of spaces between the incisors. This has been an observation of many of the investigators following him, one[3] noting, however, that the spaces did not always occur even though we could expect spacing because the teeth were reduced in their lateral diameter and that, therefore, this general condition of smallness could not, in all cases, be the cause. Since spacing has been so generally noted, though not stressed as of diagnostic significance, the relative frequency of its occurrence is of interest and may be more significant than originally considered.

Tardy or delayed eruption[1, 3, 6] of the deciduous teeth was pretty generally noted. This was attributed to a state of general health and a sign of delay in general physical development. There appeared to be difference of opinion regarding the eruption of the permanent set; some[2, 5] feeling that they were accelerated in their development, while others believed that they were retarded as in the deciduous set because of the general retardation in physical development.

Dwarfing (microdontism), or a diminishing of the size of the tooth in all diameters, without disturbing its typical form, is mentioned by several investigators, particularly by Cavallaro,[2, 6] who explained it as probably due to a form of cessation of growth, occasionally encountered in congenital syphilis, which sometimes produces atrophy of a single organ, at other times, a general atrophy (infantilism). This dwarfing does not occur in a symmetrical manner and is confined to a few teeth. This was verified in our group where occasionally one or perhaps two dwarfed molars or incisors were found in a mouth; if two molars, they were on the same side, one in the upper and one in the lower arch.

The persistent reference to missing teeth, particularly the maxillary second incisors, in the mouths of congenital syphilitics, leads one to suppose that this condition is due to lues; but, in spite of an excellent article[10] on the subject, I am inclined to believe that the absence of incisors in these cases may be explained as due to normal variations and their occurrence here is a coincidence, representing only a normal variation, because in our group, we found only three cases of missing lateral incisors, one only in each case, and I do not believe that number constitutes an unusually high percentage. An examination of a large number of models of patients under orthodontic treatment revealed about this percentage with missing lateral incisors. Davis,[11] in his study of 465 cases of harelip and cleft palate, expressed his belief that a relation exists between the absence of the lateral incisor in one generation and the presence of harelip in the succeeding, and adds, "we have not been able to prove syphilis an etiological factor in any case."

Some writers, especially Cavallaro, seemed to attach great importance to the high-arched palate which he terms, "ogival palate" in the description of which he says: "The roof is high as though the two arches crossed at the level of the nose." He thought this high arching causes a pushing forward and rotation of the incisors and a superior prognathism. In addition to this he mentioned that the maxillary arch may be small, narrow in front or elliptical in form, or it may appear to be shorter as though arrested in growth. The atrophy of the premaxilla has already been mentioned.

The mandible is generally believed to be practically free from the influence[3, 4, 7] of this disease. But some think there may be hypoplasia of the two rami, generally hypertrophy producing a prognathism, or an atrophy. Chompert and Dechaume[13] claimed to have found in some cases a transverse narrowing of the mandible with a projecting, pointed chin. However, as all of these conditions were alluded to in such a general way, one wonders if the authors themselves were convinced and the condition could not just as well be attributed to variation, family characters, or some endocrine[8] disturbance.

My observations were made on a group of 100 patients under treatment for interstitial keratitis at the Will's Eye Hospital Clinic, of ages varying from 3 to 43 years.

Of those cases in which the deciduous teeth only were present, there were but eight, ranging in age from 3 to 7 years. In one of these, a child of three years suffering from paralysis of the limbs,[12] occasionally found in congenital syphilis, there appeared two distinctly notched incisors. These were not, however, Hutchinsonian teeth, but typically shaped incisors, with a notch resembling

a knife cut in the middle of the cutting edge. There were no other hypoplasias except a suspicious discoloration of the second deciduous molars on one side, the nature of which, on account of the physical condition of the patient, could not be determined. The dental arches were well formed though somewhat narrow, and the overbite of the incisors was deep. Otherwise, the occlusion was normal. The most interesting feature of the mouth, however, was the palate, which was high and narrow with an alveolar ridge that was flat and wide. The teeth were planted in the middle of this curved plateau in an even and symmetrical manner, making the dental arches almost normal in width, though the palate was extremely narrow. There was no spacing of the incisors, and the teeth were free from decay. Of the other seven, there were three showing hypoplasias of the second deciduous molars, but in only one did this occur in both the maxillary and mandibular molars. Another of this group, aged 3 years, showed hypoplasia, of the erosion type, in all the teeth of the upper arch, which were worn to almost the gum line, while the teeth of the mandibular arch appeared normal. This condition was found in a lesser degree (Fig. 1) in several of the younger patients and might be construed as a substantiation of Cavallaro's[6] belief that this type of erosion is due to congenital syphilis. We must not overlook, however, that under normal conditions the deciduous teeth became somewhat worn before their loss and that the habit of "grinding" the teeth produces a condition closely resembling that just described.

The variation in overbite of the deciduous incisors is so great that it would be unsafe even to suggest the possibility of an open-bite in the deciduous teeth due to congenital syphilis, but there was present in some a condition that might be interpreted as the initial stage (Fig. 2). This, however, is only a suggestion. The fact that in four there was found hypoplasia of the teeth and in four a definite high palate may, however, be of some significance.

It is recognized, of course, that an examination of so small a group is of no decisive value, but it is interesting for the comparison it permits with the views of others. We did not find anything in the deciduous teeth that might be characteristic and most certainly nothing considered pathognomonic of congenital syphilis. As to incisor spacing it must be remembered that such could be accounted for as a normal developmental condition, usually found in the deciduous teeth before they are shed.

Investigators are practically unanimous in attributing to syphilis the high caries susceptibility of the deciduous teeth. Since we had in this group a number of children with mixed dentures (Fig. 3), in which there should have been under normal conditions an almost complete complement of deciduous teeth, it was possible to check this observation. Assuming that the loss of any of these teeth before their allotted time was due to caries, an examination revealed a surprising number of teeth lost prematurely and an alarming prevalence of caries in those remaining. This would seem to substantiate the claims of some that lues is the cause of high caries susceptibility in these patients, but there are, I feel, other factors such as diet and environment which should be considered. As we believe that premature loss of the deciduous teeth is an important etiologic factor in malocclusion, we should expect to find considerable malalignment of the permanent teeth as a result of this factor alone, an expectation which, however, was not verified.

The first consideration in the permanent dentition naturally falls to the central incisors. Excluding those cases in which this tooth had not yet erupted, there remained 86 cases. Of these, 66 (76.5 per cent) showed disturbances of development. This was not always symmetrical but took the form of Hutchinson teeth (Fig. 4), dwarfing, and screw-driver (Fig. 5) pattern, as well as some few with other types of enamel hypoplasias, particularly that of thinning of the incisal edge (Fig. 6). The typical Hutchinson incisor was found in 23 (26 per cent) individuals. It is worthy of note, however, that there were 6 of this group in which this particular stigma was confined to one tooth (Fig. 7), its mate of the opposite side being dwarfed or, as happened frequently, of the screw-driver pattern.

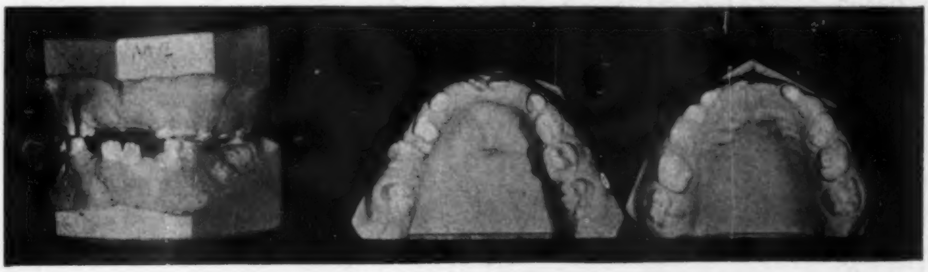


Fig. 1.—Female, aged 6 years. Deciduous teeth show excessive erosion of occlusal surface. Six-year molars mulberry pattern.

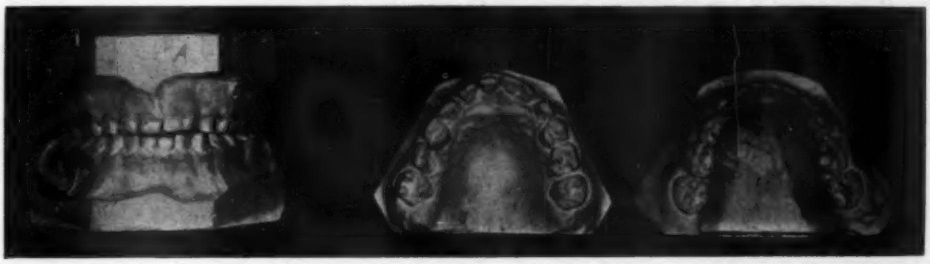


Fig. 2.—Female, aged 6 years. No hypoplasia of deciduous teeth. Incisors show functional wear indicating open-bite is just beginning to develop. Six-year molars are mulberry.

Fig. 3.—Female, aged 7 years. Example of premature loss of deciduous teeth, presumably due to high caries susceptibility which has extended to permanent molars. Maxillary first incisors are Hutchinson and second incisors pegged. Mandibular incisors are constricted and notched.

In considering hypoplasia of the 6-year molar, which seems to have a better claim[3, 4, 6] to the position of being pathognomonic of congenital syphilis, we have 92 individuals in which these teeth were or had been present. When I

mention that in 13 there were no 6-year molars present, and that we are justified in assuming that they succumbed early to caries because of a low resistance on account of enamel hypoplasias, our percentage would well be 60 instead of 40. When we note further that in only 48 of the whole group, were all four molars present, we can reasonably expect that hypoplasia was instrumental in their loss

Fig. 4.—Female, aged 10 years. Hutchinson incisors. Lower first incisors dwarfed, notched and spaced. Four mulberry molars.

Fig. 5.—Female, aged 10 years. Maxillary first incisors screw-driver and dwarfed. Second incisors normal and indicate normal overbite. Four molars mulberry. Four mandibular incisors show evidence of hypoplasia. Hypoplasia of mandibular second deciduous molars.

Fig. 6.

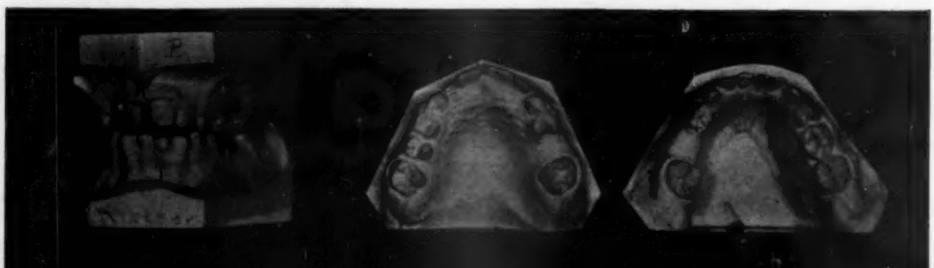


Fig. 7.

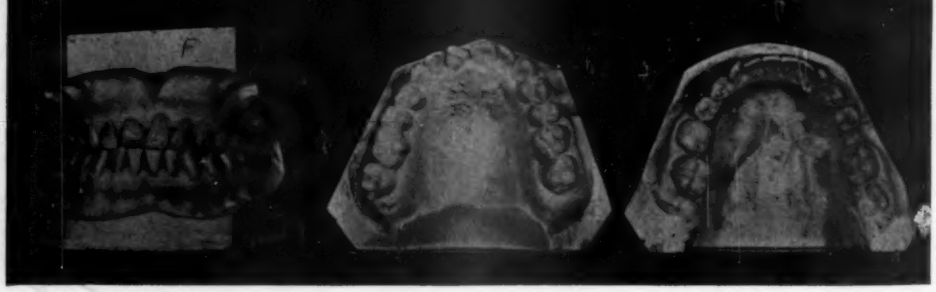


Fig. 6.—Female, aged 8 years. A good example of thinning of incisal third of maxillary first incisors which are also slightly screw-driver. Mandibular left first incisor dwarfed. Four 6-year molars mulberry. Premature loss of deciduous molars.

Fig. 7.—Female, aged 17 years. Maxillary right first incisor Hutchinson. Left maxillary incisor typical form but somewhat dwarfed. First maxillary 6-year molar and first mandibular on same side mulberry.

as well. With the molars as well as the incisors, the teeth were not affected symmetrically (Fig. 8). In some cases, but one mulberry molar was found, associated with three normal teeth, and at times, with one dwarfed and two normal. The asymmetry of their occurrence is emphasized by an examination of the following table of the 40 cases having four 6-year molars present:

4 mulberry molars	present in	13 cases
3 mulberry molars	present in	7 cases
2 mulberry molars	present in	12 cases
1 mulberry molar	present in	8 cases

Fig. 8.

Fig. 9.

Fig. 8.—Female, aged 17 years. One maxillary first incisor notched but not Hutchinson. One mandibular incisor dwarfed. Maxillary molars normal. Mandibular molars mulberry.

Fig. 9.—Female, adult. Maxillary incisors screw-driver. Lingual position of left premolar probably caused by premature loss of second deciduous molar, and has no connection with lues. Maxillary first molar, mulberry. Mandibular incisors spaced. Mandibular first molars lost. Open-bite malocclusion.

The lateral incisors were affected much less frequently, the disturbance taking the form of dwarfing or a thickening and pegging, principally, with some isolated cases of hypoplasia of other types. In the mandible the first incisors were almost always affected jointly with the maxillary incisors, and while there were a few instances of notching, sometimes incorrectly referred to as Hutchinson teeth, it usually took the form of a simple dwarfing or reduction in the size.

One of the conditions already mentioned that has attracted the attention of all the investigators, from Hutchinson down, is the frequent occurrence of what we term an "open-bite," or the failure of the incisors to meet when the jaws are closed. A tabulation of this phenomenon revealed in the 98 patients with (including deciduous) incisor teeth:

Open bite	37 or 37.75 per cent
Edge to edge	27 or 27.50 per cent
Slight overlap	14 or 14.33 per cent

Normal	10 or 10.00 per cent
Deep overbite	10 or 10.00 per cent
No incisors	2

Seeing such a large number of cases in which an open-bite was present, it occurred that the dental height might tell the story. In this respect it was surprising to find that while in open-bite cases the dental height varied from 8 to 26 mm., the dental height in some deep overbite cases was as much as 8 mm. In other words some of these open-bites must be due to a retarded vertical development of the teeth themselves (Fig. 9). This is particularly true in the shortened screw-driver and Hutchinsonian type incisors, and it is only when the disturbance has been severe enough to affect the development of the bones of the face, principally the maxilla in the premaxillary region, as noted by Hutchinson, Fournier, and Cavallaro, that we have a real open-bite, and the dental height is disturbed to any extent (Fig. 10). In all cases in which the dental height exceeded 11 mm. the open-bite was also associated with Hutchinson or screw-driver incisors and mulberry molars (Fig. 11). These could well be considered what Hutchinson termed severe cases. It is of interest to note here that one case was found in which Hutchinson incisors and mulberry molars were associated with a deep overbite (Fig. 12) instead of the expected open-bite.

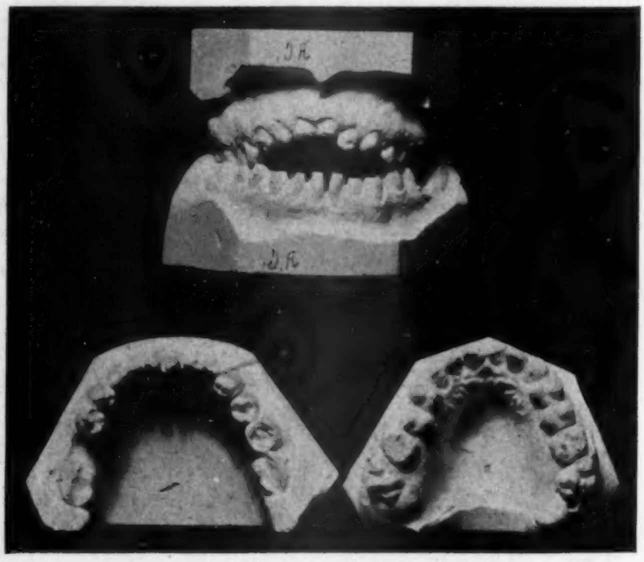


Fig. 10.—Female, adult. Six anterior teeth of both upper and lower arches affected. Hutchinson incisors. Three first molars present mulberry. Marked open-bite.

The dental arch, typical of congenital syphilis, has been described by many as narrow and pointed with, in many cases, protruding incisors. The group examined did not closely follow this pattern. The type of arch encountered most frequently was one with a rounded anterior segment, narrow in the canine region and diverging in almost straight lines backward (Fig. 13), as noted by Cavallaro.[6] After all this is what one would expect from the fact that the six anterior teeth are almost always smaller in their lateral diameters. There were a few ovoid,[3] a few U-shaped, and a few saddle shaped (Fig. 14), but the majority were of the type described. I could see little asymmetry in arch

form. As a matter of fact, I was surprised to find so little about the form of the dental arches of this group that one could consider out of the ordinary.

Diverging	about	50 cent cent
U-shaped	about	20 per cent
Ovoid	about	11 per cent
Saddle	about	10 per cent

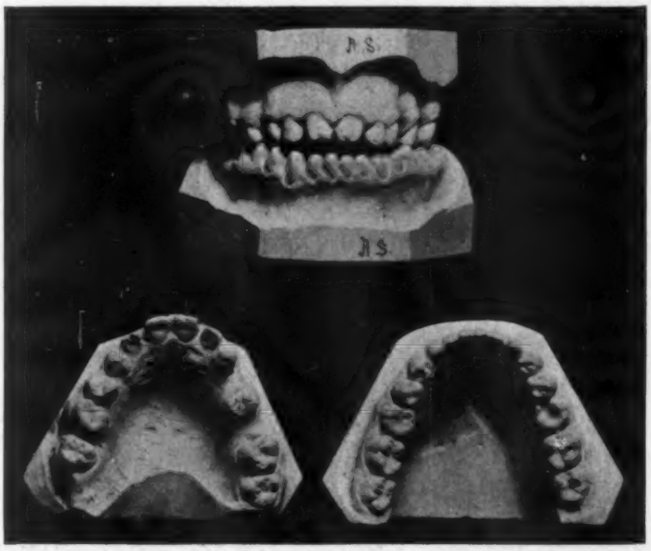


Fig. 11.—Female, adult. Hutchinson incisors. Second incisors thickened. Canines dwarfed. Mandibular incisors are only example found of teeth resembling "grains of rice," spoken of by some authors. Three remaining first molars mulberry. Open-bite malocclusion.

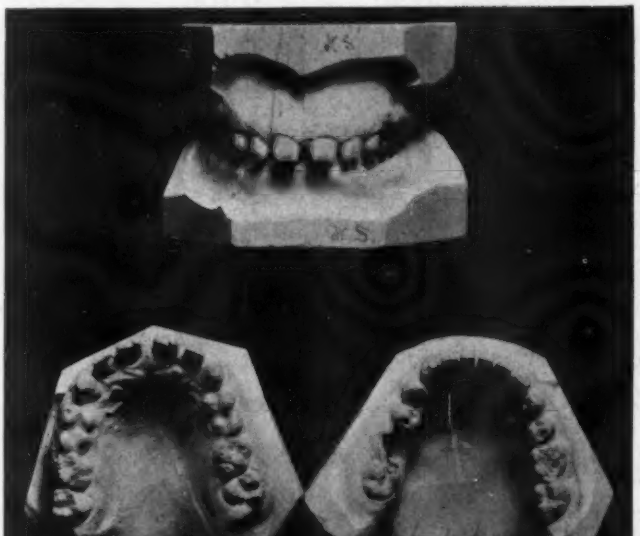


Fig. 12.—Male, aged 14 years. Hutchinson incisors. Mandibular first incisors slightly dwarfed. Three first molars present, mulberry, but not strikingly so. Upper arch U-shaped. Marked spacing of incisors both upper and lower arches. Most remarkable thing about this is, instead of an open-bite we find an excessively deep overbite.

Although previous investigators seemed to think that the mandible in some way managed to escape injury, it was found that in many cases the lower arches

gave the impression that they were unusually large. This impression was strengthened by the fact that the teeth were often found to be tipped inward, indicating that the mandible itself may have been affected. An attempt to verify this assumption was made by measuring the distance from a point of the gum margin and the buccal groove of the mandibular 6-year molars on one side, to the same point on the opposite side, and in every case, in which the mandible appeared large, it was found that the mandibular measurement was equal or greater, sometimes by as much as 6 mm. In order to get a check on this, measurements from the same points were made upon fifty models of cases in which the molars were in typical occlusion and which had never received orthodontic treatment, and the reverse condition was found to exist. In only two were the measurements the same, and they were borderline Class II cases. In the others the maxillary width exceeded the mandibular by from 1 to 5 mm., the average being 2.5 mm. Of course, I do not know that this difference in the clinic patients may not have been due to failure in maxillary development in some cases at least, but certainly this could not apply to all. The diverging sides of the maxillary arches seemed to give them the necessary width in the molar region. Franke's measurements show the mandibular arch normally larger than the maxillary arch, but it must be remembered that his measurements were made to show comparative growth and were not made from points that were opposite each other when the jaws were closed. It was impossible to make similar measurements of the arches in this group.

Fig. 13.

Fig. 14.

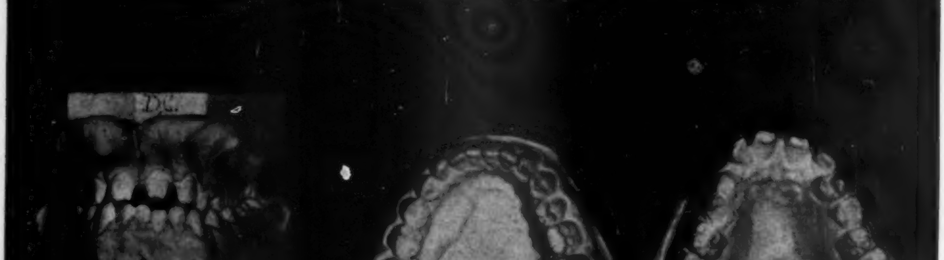


Fig. 13.—Female, aged 12 years. Hutchinson incisors. Mandibular incisors dwarfed and notched. Four molars mulberry. Edge-to-edge bite.

Fig. 14.—Male, aged 12 years. Upper arch narrow and high saddle-shaped. Hutchinson incisors. Mandibular first incisors dwarfed. One maxillary molar is typical mulberry, while the other three show some evidence of hypoplasia and are dwarfed.

We have heard much about the high palate, especially the "ogival palate" in congenital syphilis. While it must be admitted that many of those examined were high (Fig. 15), they were not excessively so in many cases, and, I believe, they gave the impression of unusual height because of the narrowness of the

dental arch in the anterior region. Only 10 (10 per cent) were found that really could be considered as coming under the classification of high palates. They were associated with narrow and, in most cases, saddle-shaped arches, and so might be considered "ogival." This is a question of personal judgment and presented on that basis only, but it appeared that in about 52 per cent the palates were of normal height, in 44 per cent the palates could be considered as high, and in 3 per cent the palates were unmistakably low.

Fig. 15.

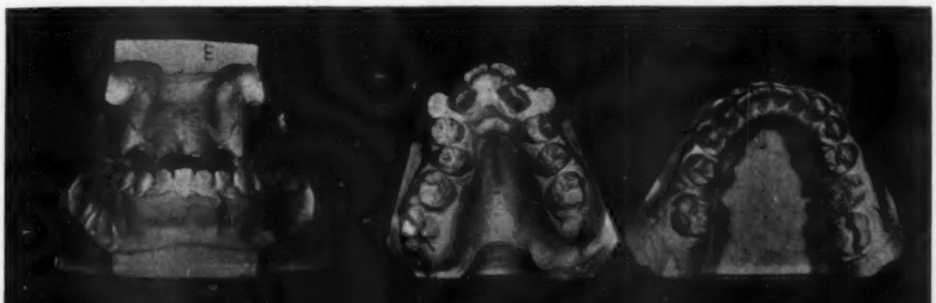


Fig. 16.

Fig. 15.—Female, aged 16 years. Maxillary incisors slightly screw-driver. Thinning of incisal third of first and second incisors on left side only. Two molars remaining in mouth mulberry. Very high saddle-shaped arch and open-bite.

Fig. 16.—Female, aged 13 years. Hutchinson incisors. Maxillary second incisors dwarfed. Mandibular canines and incisors dwarfed and evidence of hypoplasia. Three first molars remaining mulberry. Narrow upper arch. Open-bite, Class II malocclusion.

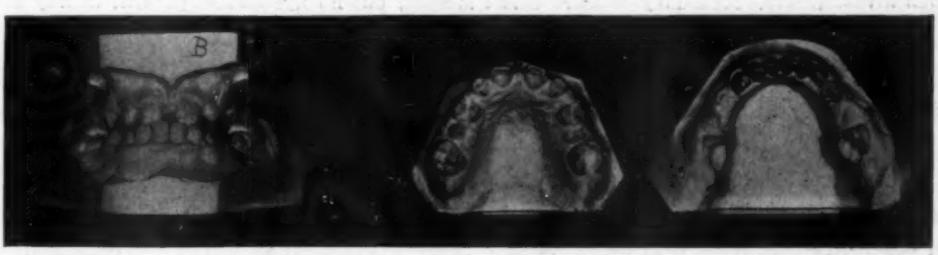


Fig. 17.—Female, aged 11 years. Maxillary incisors screw-driver with crescentic thinning of incisal edge. Second incisors thickened and conical. Mandibular incisors show evidence of hypoplasia. The only molar remaining is compressed but no evidence of hypoplasia. Class III malocclusion.

When we come to the question of malocclusion, there is little to record aside from the open-bite. The degree of irregularity in alignment of the teeth, while occasionally present, was negligible. This is surprising when we recall the high caries susceptibility found in the deciduous teeth. A few malocclusions of the "cross-bite" variety were present, probably due to growth disturbances affecting the maxilla and mandible. Only four Class II malocclusions (Fig. 16) (postnormal) were found and of these, one only of the typical protrusion type, claimed by Cavallaro, as commonly found in congenital syphilis. The classification of some was made doubtful by loss of teeth. There were three Class III

(Fig. 17) (prenormal), one doubtful. There were quite a number that seemed to have a tendency toward mesioclusion; the chin was prominent and mandible slightly large for good facial balance. This prenormal tendency and the fact that the Class III occurred more frequently than is usual may be significant.

Spacing of the incisors was found to be fairly constant (Fig. 18), but by no means always in both arches. In some instances the reverse, or slight crowding of the incisors, was encountered. The spacing apparently could not be accounted for by the diminished size of the teeth because, as previously stated, in some cases in which the teeth were much dwarfed, they were also close together. Examination of the 87 having permanent incisors revealed spacing of these teeth in 47 (55 per cent). In 29 (34 per cent) of these the spacing was confined to one dental arch.

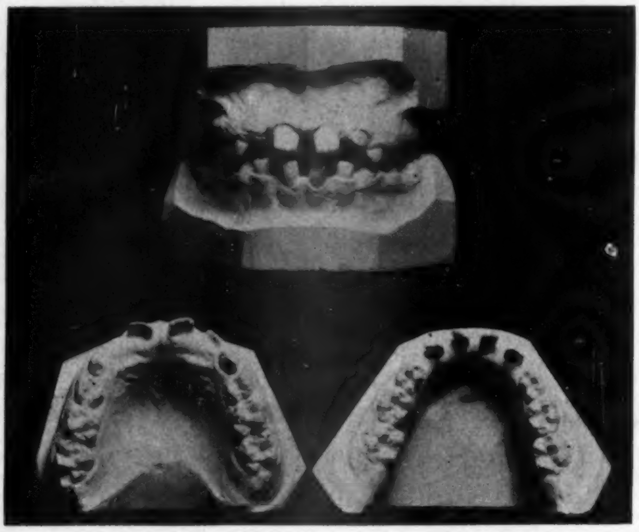


Fig. 18.—Male, aged 7 years. Good example of unusual spacing of incisors noted by various investigators. Maxillary incisors chisel shaped, but no hypoplasia present in any of the teeth.

This group seemed to confirm Hutchinson's[2] belief that, "Bad teeth were not in any special manner associated with syphilis and that the permanent teeth did not appear to be unusually liable to caries," because with the exception of the 6-year molar, which on account of its poor enamel, should be more susceptible to caries, the teeth were found to be surprisingly healthy. In one case, a man 43 years old with a typical saddle nose, no dental stigmas were found, and a practically perfect set of teeth was present with the exception of the four first molars, which had apparently been lost early. None of the remaining teeth were carious, being strong and well formed with cusps and incisal edges normally worn.

In general, this survey confirmed opinions expressed by previous investigators. Some of the observations, however, are of interest because they were not wholly in accord with previous findings.

SUMMARY

1. There was no particular type of malocclusion occurring with sufficient frequency to be considered characteristic of congenital syphilis.

2. While the open-bite was frequent, it seemed to occur only in those cases in which the onset had been severe enough to affect jaw development. In cases without hypoplasia the overbite was normal, and where the overbite was slight or edge-to-edge, there was thinning of the incisal portion and a probable failure of the crown to reach its normal vertical dimension. We may infer that the edge-to-edge or slight overlapping is due to a disturbance in the development of the teeth themselves and that in these cases the jaw development is normal.

3. Neither could the spacing of the incisors be considered typical. Though of frequent occurrence, it could not be explained as due to the reduction in their lateral diameters, because crowding was occasionally found where the teeth were much reduced and spacing occurred in some cases where the teeth appeared to be of normal size.

4. The most common type of dental arch is that which may best be described as a diverging arch with a narrow curved anterior segment and straight diverging sides. The size did not seem to be affected except in the anterior part.

5. The mandibular arch in many cases had a tendency toward a squareness of the anterior portion with a general increase in size throughout.

6. The "ogival" or high-arched palate was rare and, when found, was usually associated with a narrow, saddle arch. While many of the palates seemed somewhat high, they were not deformed and not as high as the literature would lead one to expect.

7. With the exception of the first molars, the permanent teeth seemed no more susceptible to caries than could be expected in such a group. As a matter of fact, the teeth, with exceptions mentioned, were as a rule good.

8. The incidence of missing teeth, particularly the maxillary second incisors, was not nearly as high as expected and leads one to discount congenital syphilis as a factor.

I wish to acknowledge my indebtedness to James V. Klauder, M.D., whose kindness made the work possible, and to R. D. Skidmore, D.D.S., for his valuable assistance.

REFERENCES

1. Jeans and Cooke: Prepubescent Syphilis, 1930, Appleton and Co.
2. Hutchinson, Jonathan: Influence of Hereditary Syphilis on the Teeth, Trans. Odont. Soc., London, pp. 95-104, 1857-60.
3. Fournier, Alfred: Syphilitic Teeth. Translated by James William White, Dental Cosmos pp. 141-155, 1884.
4. Stein, John Bethune: Syphilitic Hypoplasia of the Teeth, Dental Cosmos **55**: 691, 1913.
5. Holt, L. Emmett, and Howland, John: Disease of Infancy and Childhood, New York, 1928, D. Appleton and Co., pp. 213, 931.
6. Cavallaro, Joseph: Syphilis in Its Relation to Dentition, Dental Cosmos **50**: 1154-1174, 1908; **51**: 1325-1344, 1909.
7. Kranz, P.: Zahndeformitäten bei angeborener Syphilis Handbuch der Haut und Geschlechtskrank, Jadassohn Vol. XIX, Abs. Translation.
8. Hess, Alfred E.: Rickets, Osteomalacia and Tetany, Philadelphia, 1929, Lea and Febiger, pp. 234.
9. Schamberg, J. F., and Wright, Carol F.: Congenital Syphilis, Venereal Disease Information **10**: 421, 1929.
10. Campbell, David Kenneth: Congenitally Missing Upper Lateral Incisors, Dental Cosmos **76**: 459, 1934.
11. Davis, Warren B.: Harelip and Cleft Palate, Ann. Surg. **81**: 536, 1925.
12. Campbell, Ellis C.: Orthopedic Surgery, Philadelphia, 1930, W. B. Saunders Co., pp. 461.
13. Chompert and Dechaume: Congenital Syphilis of the Inferior Maxillary Bone, Rev. Stom., Paris **30**: 647, 1928.
14. Karnosh, Louis J.: Histopathology of Syphilitic Hypoplasia, Arch. Dermat. and Syph. **13**: 25, 1926.

SOME CONCEPTS OF THE ANATOMY OF THE HEAD AND NECK

A. R. BUCHANAN, M.D., DENVER, COLO.

THE purpose of this paper is to review briefly the anatomic relationships of the bones of the skull and of those muscles which may act upon them, either directly or indirectly. The specific actions of the muscles will be given as accurately as possible; the orthodontic effects of their actions can be much better discussed by the orthodontists themselves, who are in a position to do so from the point of view of experience and careful observation.

THE BONES OF THE SKULL

Since the orthodontist is primarily interested in those bones which enter into the formation of the face, these will be discussed first and in somewhat greater detail than those which have no connection with it. The bones which form the skeleton of the face are the frontal, the two maxillae, the two nasal bones, the two malar or zygomatic bones, and the mandible. More posteriorly, but nevertheless important, since the mandible articulates with them, are the two temporal bones. Also posterior and articulating with the frontal bone are the two parietal bones. The greater wings of the sphenoid assume importance in the formation of the temporal and infratemporal fossae. Finally, and very important in the maintenance of the skeleton of the nose, there is the vertical plate of the ethmoid which articulates with the two nasal bones at their point of articulation with one another.

The *frontal* bone consists of two portions, a vertical and a horizontal. The latter need not concern us too much; it forms the roofs of the orbital cavities and the greater part of the floor of the anterior cranial fossa. The vertical portion (Figs. 1 and 2) forms the upper part of the face, or forehead; it articulates superiorly and posteriorly with the two parietal bones, as has been mentioned, and with the greater wings of the sphenoid. At the junction of the vertical with the horizontal part of the bone are the supraorbital margins. Medially these margins are carried downward as the internal angular processes which articulate with the frontal processes of the maxillae and with the nasal bones; laterally they extend downward as the external angular processes to articulate with the frontal processes of the malar bones. Slightly above the supraorbital margins are the superciliary ridges and above them the frontal eminences. The line of articulation between the frontal and parietal bones is designated the coronal suture.

The *maxilla* consists of a roughly pyramidal-shaped body and several processes. The base of the pyramid forms a considerable part of the lateral wall of the nose. The apex presents a roughened articular surface for the malar bone and has, therefore, been called the malar process. The superior surface of the

From the Department of Anatomy, University of Colorado, Denver.

Read before the Sixth Summer Seminar for the Study of Orthodontics, Denver, Colorado, July 28, 1941.

maxilla forms the floor of the orbital cavity; the anterior or facial surface (Fig. 1) lies lateral and inferior to the anterior nares and immediately below the orbit. The anterior nasal spine projects upward and forward where the anterior surfaces of the right and left maxillae meet in the midline. The anterior surface presents the incisor fossa over the lateral incisor tooth; external to the fossa is a well-marked ridge over the canine socket, the canine eminence; still farther laterally is the canine fossa and above it is the inferior orbital foramen for the nerve and vessels of the same name. The posterior surface of the body of the maxilla (Fig. 2) forms the anterior boundary of the infratemporal and pterygomaxillary (pterygopalatine, sphenomaxillary) fossae. It is pierced by a number of small foramina for the passage of the posterior superior dental nerves.

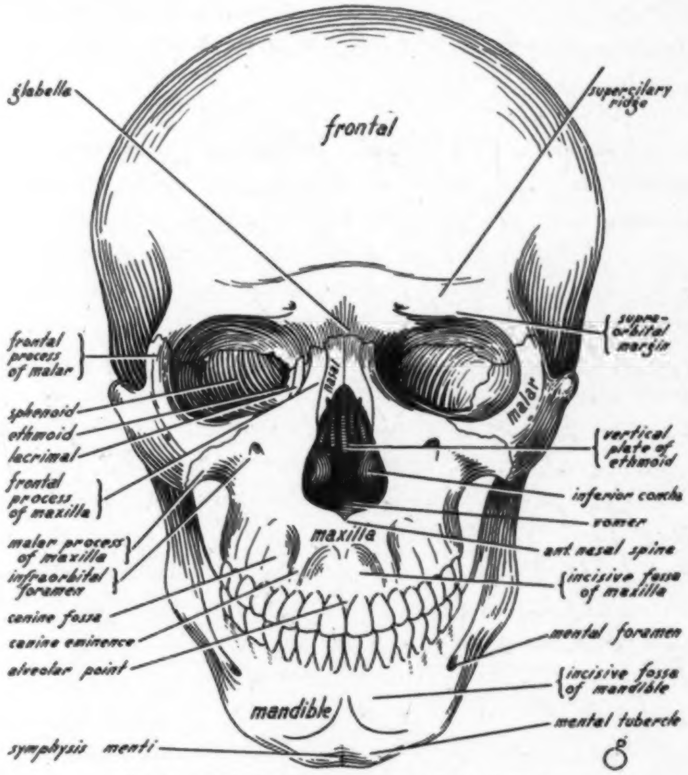


Fig. 1.—(Modified from Gray's *Anatomy*).

The frontal process of the maxilla projects upward from the anterior and medial part of the body. Posteriorly it articulates with the lacrimal bone in the medial wall of the orbital cavity, anteriorly with the nasal bone, and superiorly, as has been mentioned, with the internal angular process of the frontal bone.

The alveolar process projects downward from the body, its external surface being continuous with the anterior and posterior surfaces of the latter. Its internal surface is continuous with the inferior surface of the palate process. Both surfaces are marked by ridges indicating the alveoli of the teeth.

The palate process of the maxilla projects medially from the junction of the base or medial surface of the body with the alveolar process; it articulates with its fellow of the opposite side in the midline, forming the anterior and

major part of the hard palate. Posteriorly it articulates with the horizontal part of the palate bone which completes the hard palate in that region (Fig. 3).

The *nasal* bone is quadrangular in shape (Figs. 1 and 2) and articulates posteriorly with the frontal process of the maxilla, superiorly with the nasal notch of the frontal, a notch formed between the two internal angular processes, anteriorly in the midline with its fellow of the opposite side, and inferiorly with the alar cartilage of the nose. In the absence of the alar cartilages, as in the dried skull, the inferior borders of the nasal bones form the upper boundary of the pyriform opening or anterior nares.

The *malar* bone (Figs. 1 and 2) forms the prominence of the cheek, the outer anterior boundary of the orbit, and most of the wall separating the orbit from the temporal fossa. From its posterior inferior angle the temporal process projects toward the malar process of the temporal bone with which it articulates to form the malar arch. The medial surface of the malar is mostly articular with the apex or malar process of the maxilla.

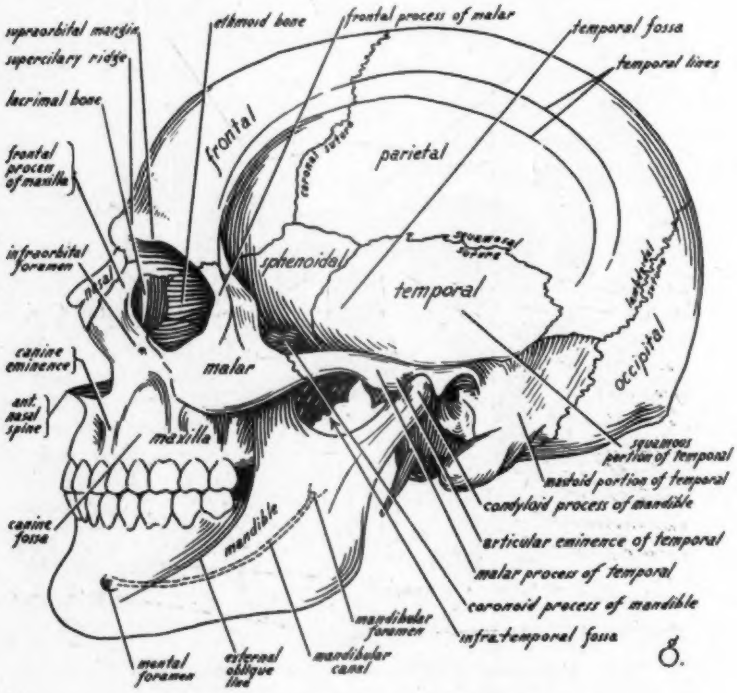


Fig. 2.—(Modified from Gray's *Anatomy*).

The *mandible* or lower jaw (Figs. 1 and 2) develops as symmetric right and left halves which fuse. The bone consists of a central part or body which supports the teeth, and two rami which project upward from the posterior limit of the body on either side. The rami present two processes each, the coronoid for attachment of the temporal muscle and the condyloid for articulation with the glenoid fossa of the temporal bone. The anterior midline of the body is known as the symphysis menti and represents the line of fusion of the original halves of the bone. A short distance from the median line at the lower border of the body, on either side, is the mental tubercle. A slight depression, the incisor fossa, is found below the teeth of that name on the front of the bone. The mental

foramen for the terminal branches of the inferior dental nerve and vessels is somewhat below the middle of the bone under the premolar teeth. The external oblique line, starting from the mental tubercle, passes below the mental foramen and continues posteriorly into the anterior border of the ramus. On the lower side of the bone, rather to its inner side and behind each mental tubercle, there is an oval fossa for the attachment of the anterior belly of the digastric muscle. The mental spines or genial tubercles are two pairs of small, sharp spines near the lower border of the inner side of the symphysis, for the genioglossus and geniohyoid muscles. The internal oblique line or mylohyoid ridge begins near the genial tubercles and ends on the inner surface of the ramus. The alveolar process of the mandible is of the same nature as that of the maxilla.

Fig. 3.—(Modified from Gray's *Anatomy*).

The rami of the mandible join the body at an angle of 110 to 120 degrees in the adult (Piersol). At birth it is about 140 degrees. With the loss of the teeth, the alveolar process atrophies and the angle again tends to approach that of the infant. At about the center of the inner surface of the ramus is the mandibular foramen through which the inferior dental nerve and vessels enter the bone. Overhanging this foramen anteriorly and superiorly is a small spicule of bone, the lingula, to which is attached the sphenomandibular ligament. Since the

foramen is located at the point about which the mandible rotates during normal opening and closing of the mouth, the above ligament becomes important in maintaining this relationship. The coronoid and condyloid processes of the ramus will be considered as they relate to the temporomandibular articulation and the movements of the mandible.

The *temporal* bone (Figs. 2, 3, and 4) consists of two main parts, the squamosa and the petromastoid portion. The former has an extensive vertical portion which enters into the formation of the temporal fossa and the lateral wall of the cranial cavity, and a horizontal portion. The latter forms a part of the floor of the middle cranial fossa and presents, on its inferior surface, the glenoid fossa, bounded anteriorly by the anterior glenoid ridge or articular eminence, and posteriorly by the postglenoid ridge.

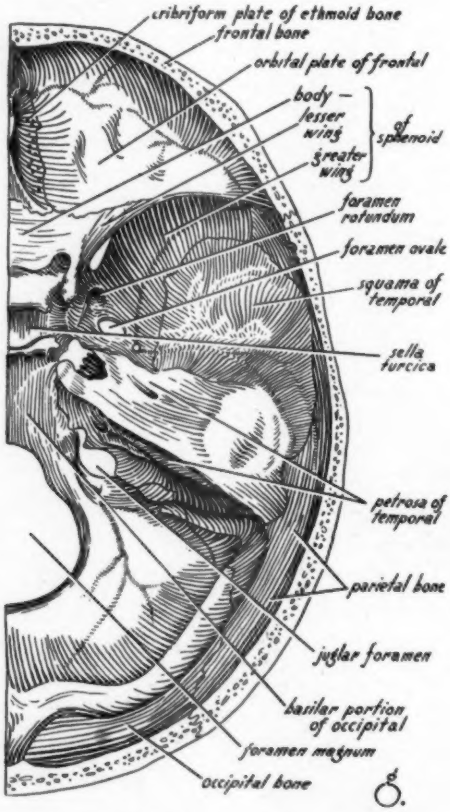


Fig. 4.—(Modified from Gray's *Anatomy*).

The temporomandibular joint includes the glenoid fossa, the condyle of the mandible, and a fibrocartilaginous disk or meniscus which is interposed between the fossa and the condyle. The capsule of the joint is attached to the margins of the fossa, to the periphery of the meniscus, and to the borders of the rounded articular surface of the condyle. The meniscus thus actually divides the joint cavity into a superior and an inferior portion. The former serves for articulation between the glenoid fossa and articular eminence above and the meniscus below; the latter contains the articulation between the meniscus and the condyle of the mandible. Thus, the combination of a hingelike movement between con-

dyle and meniscus and a sliding or gliding motion of the meniscus and condyle forward over the articular eminence is facilitated. It is this combination of movements which accounts for the fact that the region of the mandibular foramen becomes the center of rotation of the mandible, as has been stated. The muscles responsible for the movements of the mandible will be discussed shortly.

The petromastoid portion of the temporal bone (Figs. 3 and 4) projects medially between the occipital bone and the greater wing of the sphenoid, thus dividing the posterior from the middle cranial fossa and forming a part of the floor of each. Laterally it terminates in the expanded and downward projecting mastoid process. Within the petrous portion of the bone are found the middle and inner ear structures. The mastoid portion contains the mastoid cells which are prone to extension of infection from the middle ear with which they are connected. The external auditory canal is located immediately anterior to the mastoid process, bounded above by the most posterior part of the squamosa and inferiorly by the tympanic portion of the temporal bone. The tympanic part of the temporal bone has not been mentioned previously, but is important since it has an intimate posterior relationship to the temporomandibular articulation.

The *sphenoid* bone (Figs. 3 and 4), located in the floor of the cranial cavity, has a body, two lesser wings, two greater wings, and two pterygoid processes, the wings and pterygoid processes springing from the body. The body is located almost exactly in the center of the cranial floor, articulating anteriorly with the ethmoid bone and posteriorly with the basilar process of the occipital bone. Superiorly the body presents the sella turcica which contains the pituitary gland and which is bounded posteriorly by the dorsum sellae and anteriorly by the tuberculum sellae.

The four wings project laterally from the body, the lesser two forming a part of the roofs of the orbital cavities and a part of the floor of the anterior cranial fossa. The greater wings present four surfaces, superior which enter into the floor of the middle cranial fossa, anterior which form the greater parts of the lateral walls of the orbital fossae, inferior which form the upper boundaries of the infratemporal fossae, and lateral which form parts of the temporal fossae and give origin to the temporal muscles. The greater wings are important from the dental point of view since they are pierced by the foramina ovale and rotundum which give passage respectively to the mandibular and maxillary divisions of the fifth nerve. These nerves, as is well known, are sensory to all the teeth; the masticator nerve is intimately associated with the former and supplies the four main muscles of mastication.

The pterygoid processes (Fig. 3) project downward from the posterior part of the junctions between the body and greater wings; each process is made up of two laminae, an external and an internal. Anteriorly the two laminae articulate with one another, with the vertical plate of the palate bone, and, to some extent, with the body of the maxilla. Between the body of the maxilla and the upper half of the pterygoid process and bounded medially by the vertical plate of the palate bone is the pterygopalatine fossa. Posteriorly the two laminae diverge; the external lamina gives origin to important muscles of mastication, the external and internal pterygoids.

The *ethmoid* bone (Figs. 2 and 4) is made up of two lateral masses, each of which is placed between orbital cavity and nasal fossa. Thus a part of the medial wall of the orbit and a part of the lateral wall of the nose is formed by the ethmoid bone. The two lateral masses are connected superiorly by the cribriform plates which, therefore, enter into the floor of the cranial cavity and the roof of the nose. The vertical plate of the ethmoid is midway between the lateral masses and, together with the vomer, forms the median septum of the nose, articulating, as previously mentioned, with the two nasal bones anteriorly and with the septal or triangular cartilage which forms the most anterior and flexible part of the septum.

The *parietal* bones (Fig. 2) have been mentioned as articulating with the superior border of the frontal bone at the coronal suture; they form the greater part of the roof of the cranial cavity and contribute a large part of the areas from which the temporal muscles arise. In the superior midline of the skull they articulate with one another at the sagittal suture. Inferiorly, each parietal bone articulates with the greater wing of the sphenoid, the squamosa of the temporal bone and the mastoid portion of the same. Posteriorly they articulate with the occipital bone.

The *occipital* bone (Figs. 2, 3, and 4) is a diamond-shaped flat bone which forms the posterior and inferior part of the skull. It is placed between the sphenoid and temporals anteriorly and the parietal bones posteriorly. It presents the large foramen magnum which allows passage of the spinal cord from the cranial cavity to the spinal canal. Its superior surface enters into the formation of the floor of the posterior cranial fossa and its inferior surface gives origin to some of the postvertebral muscles of the neck.

All the bones of the skull have now been alluded to with the exception of the inferior conchae which are found on the lateral walls of the nasal fossae. The discussion has necessarily been very brief and lacking in detail; however, the general relationships of the bones to one another have, I believe, been made fairly clear.

POINTS OF REFERENCE ON THE SKULL

There are certain points on the surface of, and within, the skull which have long been used by anthropologists as points of reference in making specific measurements; these same points have now come to be used quite extensively by orthodontists. Some of these points, as described in Piersol's *Human Anatomy*, are therefore mentioned, as follows: the *alveolar* point is the lowest point in the midline of the upper alveolar process; the *asterion* is the lowest point of the lambdoidal suture which is the suture line between the parietal bone and the occipital bone; the *auricular* point is the center of the external auditory meatus; the *basion* is the anterior point of the margin of the foramen magnum in the occipital bone; the *bregma* is the anterior limit of the sagittal suture; the *glabella* is the rather triangular depression above the nose and between the two superciliary ridges; the *glenoid* point is the center of the glenoid fossa; the *gonion* is located at the outer side of the angle of the jaw; the *inion* is the external occipital protuberance; the *lambda* is the posterior limit of the sagittal suture; the *malar* point is the most prominent point of that bone; the *mental*

point is the most anterior point of the symphysis of the mandible; the *nasion* is the point of articulation of the frontal bone with both nasal bones; the *obelion* is at the sagittal suture in the region of the parietal foramina; the *occipital* point is the most posterior point of the skull, in the midline, and is above the inion; the *ophryon* is the point of intersection of the median line of the skull with a line connecting the tops of the orbits; the *opisthion* is the most posterior point of the foramen magnum; the *pterion* indicates the region where the frontal, the greater wing of the sphenoid, the parietal, and the temporal bones almost meet; the *stephanion* is at the point where the curved temporal crests cross the coronal suture; the *subnasal* point is in the median line at the root of the anterior nasal spine.

Brodie adds to these the *Bolton* point which is defined somewhat indefinitely as representing the height of curvature between the occipital condyle and the body of the bone. A line drawn from this point to the *nasion* is called by him the *Bolton plane.* Brodie also uses the term *gnathion* to designate the mid-point between the most anterior and inferior points on the bony chin, as seen in x-rays.

McDowell has defined the *Bolton* point as the highest point in the notch immediately posterior to the occipital condyle. In addition he mentioned an *orbital* point without defining it. Apparently it is located at the most inferior point of the infraorbital margin.

THE MUSCLES OF MASTICATION INCLUDING THE SUPRA- AND INFRAHYOID GROUPS

1. The *temporal* muscle arises from the temporal fossa, limited anteriorly, superiorly, and posteriorly by the curved temporal lines (Fig. 5). The temporal lines begin anteriorly at the external angular process of the frontal and terminate posteriorly in the region of the mastoid process of the temporal bone. The muscle thus gains origin from the frontal, parietal, temporal, and sphenoid bones. From this broad origin the fibers converge into a narrow tendon which inserts into the coronoid process of the mandible. The muscle acts powerfully in occlusion of the teeth.

2. The *masseter* muscle (Fig. 7) originates from the malar bone and malar arch; it inserts into the external surface of the angle of the jaw. By its contraction the angle is pulled upward and forward, also aiding in occlusion.

3. The *internal pterygoid* muscle (Fig. 6) arises on the internal surface of the external pterygoid lamina. From its origin it passes downward and backward to insert on the inner surface of the angle of the jaw; its action is also to pull the angle forward and upward, thus aiding in occlusion.

4. The *external pterygoid* (Fig. 6) has two heads of origin; the lower head arises from the external surface of the external pterygoid lamina and passes almost horizontally backward to insert into the neck of the condyloid process of the mandible; the upper head originates from the inferior surface of the greater wing of the sphenoid and inserts into the meniscus of the temporomandibular joint. The action of the external pterygoid muscle is to pull the condyle of the mandible and the meniscus forward over the articular eminence, thus depressing the entire mandible. Since the sphenomandibular ligament which runs from the spine of the sphenoid to the lingula prevents forward movement of the ramus at

that point, the resultant movement of the angle is posteriorly and that of the body is downward. Thus it is seen that the external pterygoid is capable of depression of the mandible without the accompanying action of those depressor muscles which act directly upon the body of the bone.

5. The *mylohyoid* muscle (Fig. 8) arises from the internal oblique line of the mandible and inserts into the body of the hyoid bone, the latter being a horseshoe-shaped bone in the neck from which the larynx is suspended. The action of this muscle which, incidentally, forms the muscular floor of the mouth, is elevation of the hyoid bone, an action which is a part of deglutition. If, how-

Fig. 5.

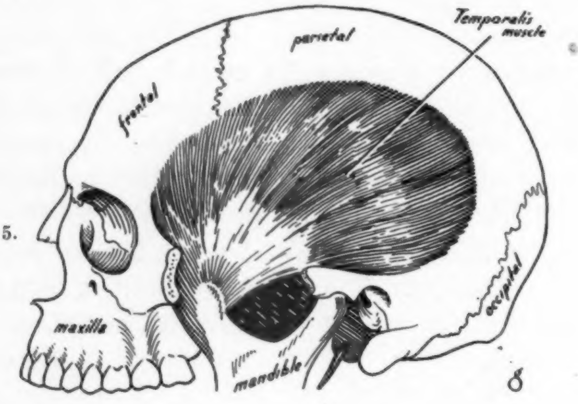
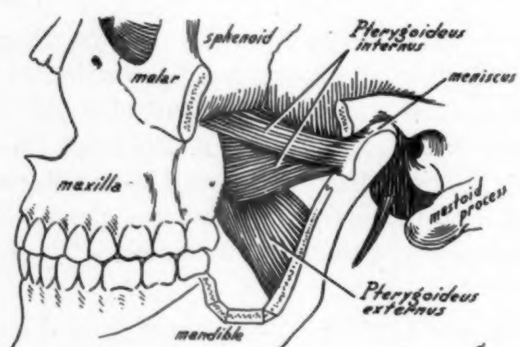


Fig. 6.



Figs. 5 and 6.—(Modified from Gray's *Anatomy*).

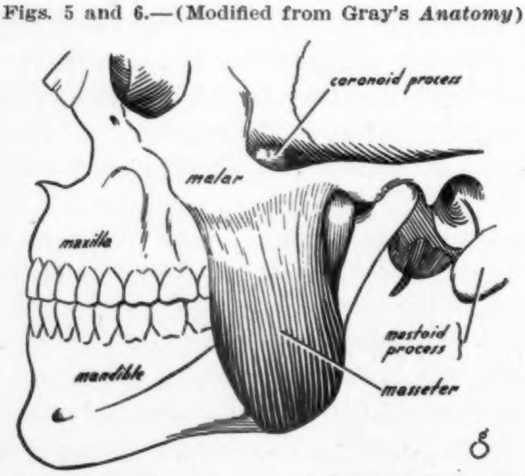


Fig. 7.—(Modified from Gray's *Anatomy* and Sobotta-McMurrich, *Atlas of Human Anatomy*).

ever, the hyoid bone is anchored against upward movement, then contraction of the mylohyoid results in depression of the mandible.

6. The muscles which are able to fix the hyoid bone against upward movement include the *sternohyoids,* the *omohyoids,* the *thyrohyoids,* and the *sternothyroids* which collectively are known as the *infrahyoid* muscles (Fig. 8). Contraction of these muscles may depress the hyoid bone which, combined with contraction of the suprahyoid muscles, makes for maximum depression of the mandible and consequent wide opening of the mouth. The origins and insertions of the infrahyoid muscles are quite obvious from their names, except that the sternohyoid gets most of its origin from the medial end of the clavicle rather than from the sternum. The omohyoid has two bellies, the upper of which is attached to the body of the hyoid bone and the lower of which is attached to the margins of the suprascapular notch of the scapula and to the transverse scapular ligament; the two bellies are connected by a central tendon.

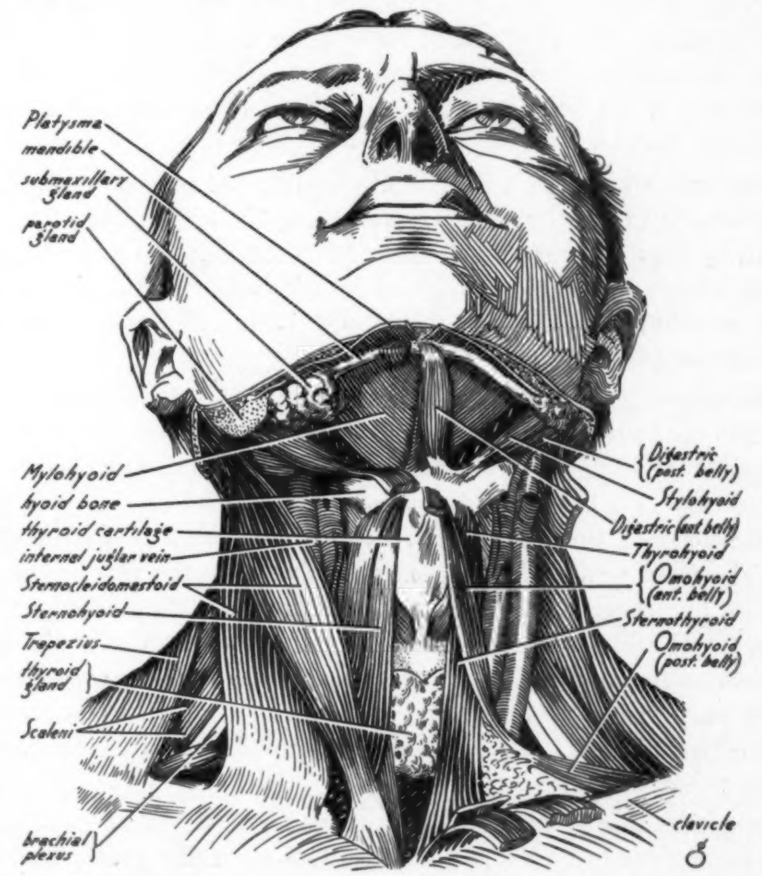


Fig. 8.—(Modified after Sobotta-McMurrich, *Atlas of Human Anatomy*).

7. Returning to the *suprahyoid* muscles (Fig. 8), the *digastric* is another which is capable of elevation of the hyoid bone or depression of the mandible. It also has two bellies, one coming from the inferior aspect of the temporal bone at the junction of the petrous and mastoid portions, the other from the digastric fossa already described as being on the inferior border of the body of the mandible immediately lateral to the symphysis. The central tendon of this muscle is

bound to the lesser cornu of the hyoid bone by a pulley-like fibrous loop, usually formed by a splitting of the tendon of the stylohyoid muscle.

8. The *geniohyoid* muscles which arise from the genial tubercles of the mandible and insert into the hyoid are also able to depress the mandible when the hyoid bone is fixed in place by the infrahyoid muscles.

THE MUSCLES OF THE FACE (PLATYSMA GROUP)

Comparative and embryologic studies of the platysma muscles have shown that at first they are confined entirely to the neck region; even in the lower mammals, however, the extension upon the head has begun and in the higher members of this group two portions can be distinguished in the muscle sheet. The more superficial of these is situated in the lateral and posterior portions of the neck and extends upon the sides of the face and over the vertex of the skull to the orbital and nasal regions of the face. The deeper one lies more anteriorly in the neck and extends upward over the jaw to the region around the mouth. In the highest forms a differentiation of both layers to form a number of more or less separate muscles takes place and reaches its maximum development in man whose mobility of facial expression is due to the existence of a considerable number of platysma muscles.

The platysma musculature is characterized by the pale color of its fibers, by being more or less intermingled with connective tissue and therefore rather ill-defined, and by its attachment to the integument. These peculiarities, together with a considerable amount of variation which occurs in the differentiation of the various muscles, have brought about not a little difference in the number of muscles recognized by various authorities.

The Superficial Layer of the Platysma Muscles.—1. The *platysma* originates from the skin and subcutaneous tissue over the pectoralis major and deltoid muscles along a line extending from the second costal cartilage to the tip of the acromion process (Fig. 8). Its fibers run upward and medially to their insertion into the body of the mandible from the symphysis to the insertion of the masseter. The more posterior fibers extend upward on the face toward the angle of the mouth, becoming lost partly in the fascia of the cheeks and partly among the muscles of the lips. The contraction of the platysma draws the lower lip downward and outward. It is an important muscle in the expressions of horror and intense surprise. It seems improbable that the muscle has much effect in producing depression of the mandible which might be expected because of its insertion into that bone (Piersol).

2. The *epicranius* is a muscular and aponeurotic sheet which covers the entire vertex of the skull (Fig. 9). It has two muscular portions, the posterior of which, called the occipitalis, arises from the superior nuchal line and inserts into the posterior border of the galea aponeurotica. The anterior muscular portion, called the frontalis, is sometimes described as arising from the anterior border of the galea and sometimes as arising from the superior orbital margins and superciliary arches; in the latter case it is said to insert into the galea. As a matter of fact, it should probably be considered to have two sets of fibers, those arising from the supraorbital margins and superciliary ridges which insert into the galea, and those arising from the galea which insert into the skin in the

neighborhood of the eyebrows and over the glabella. A prolongation of the frontalis downward upon the nasal bone is called the procerus and is frequently described as a separate muscle. The occipitalis acting alone draws the galea aponeurotica backward while the frontalis draws it forward. The frontalis also has the action of raising the eyebrows and throwing the skin of the forehead into transverse wrinkles. The epicranius is consequently the muscle employed in the expression of interrogation and surprise.

3. The three *auricular* muscles arise behind, anterior to, and superior to the auricle into which they are inserted (Fig. 9). They are of no apparent significance to the orthodontist; therefore a detailed discussion is omitted.

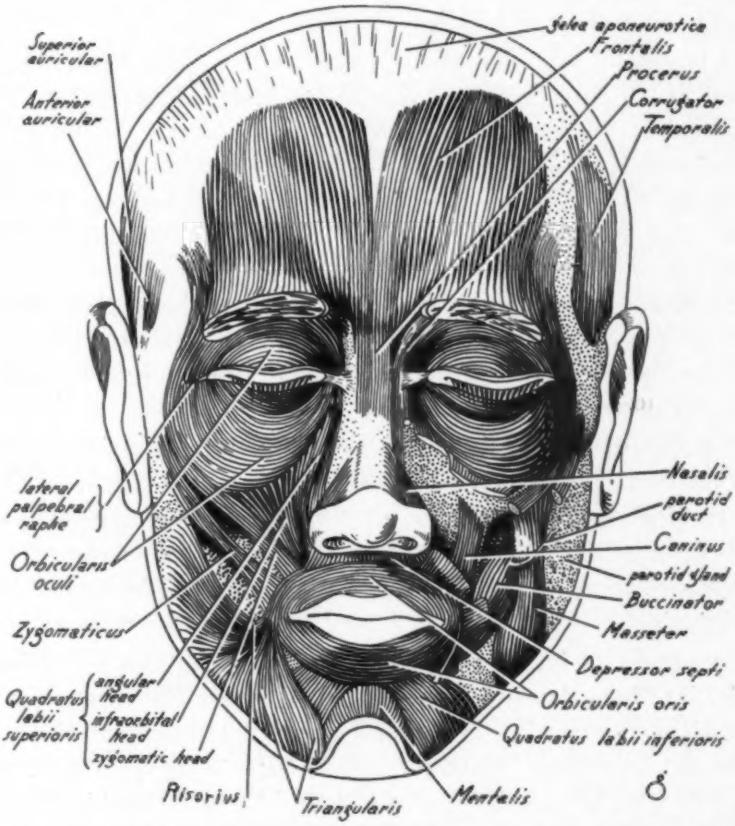


Fig. 9.—(Modified after Sobotta-McMurrich, *Atlas of Human Anatomy*).

4. The *orbicularis oculi* arises from the internal angular process of the frontal, from the frontal process of the maxilla and, slightly, from the upper and medial part of the anterior surface of the body of the maxilla, all of which points are concentrated at the internal angle of the eye (Fig. 9). From this origin the muscle fibers course along the margins of the orbit and through the substance of the upper and lower lids, terminating in the region of the lateral angle of the eye by interlacing to form the lateral palpebral raphe. Some of the fibers tend to scatter themselves among the adjacent platysma muscles, making numerous connections with them. The principal action of the orbicularis oculi is to approximate the upper and lower eyelids, closing the palpebral fissure. In addition, the attachment of the peripheral portion to the skin draws the eyebrow

downward and the skin of the cheek upward. A small part of the muscle, arising from the internal angular process of the frontal inserts into the skin over the superciliary ridge and tends to draw the eyebrows downward and inward, producing vertical wrinkles in the skin over the glabella. This portion of the muscle is often described separately as the corrugator muscle.

5. The *zygomaticus* (Fig. 9) is a slender muscle which arises from the outer surface of the malar bone, near its articulation with the malar process of the temporal bone. It runs obliquely downward and forward toward the angle of the mouth where its fibers interlace with those of the triangularis and caninus and terminate by blending with the orbicularis oris and by inserting into the subcutaneous tissue of the lip. The muscle draws the angle of the mouth upward and outward as in smiling or laughing.

6. The *quadratus labii superioris* (Fig. 9) has three heads of origin, only two of which are included in the superficial layer of platysma muscles. The angular head takes origin from the outer surface of the frontal process of the maxilla and descends along the line of junction between the cheek and the nose to be inserted into the integument of the upper lip and into the posterior part of the ala nasi. The zygomatic head arises from the malar bone anterior to the origin of the zygomaticus and is inserted into the integument of the upper lip. The principal action of the quadratus (zygomatic and angular heads) is elevation of the upper lip because of which it has often been called the levator labii superioris. The insertion of the angular head into the ala nasi enables it to aid in dilatation of the nostrils.

7. The *quadratus labii inferioris* (Fig. 9) arises from the body of the mandible beneath the canine and premolar teeth, its origin being covered by the triangularis. It runs upward and forward to be inserted into the skin of the lower lip, its fibers also intermingling with those of the orbicularis oris. Its action is to draw the lower lip downward for which reason it has been called the depressor labii inferioris.

8. The *mentalis* (Fig. 9) arises from the body of the mandible below the incisor teeth; its fibers descend and are inserted into the integument above the point of the chin. The action is to draw upward the skin of the chin, causing protrusion of the lower lip. When its action is combined with contraction of the two triangularis muscles, an expression of haughtiness or contempt results.

The Deep Layer of Platysma Muscles.—1. The *orbicularis oris* (Fig. 9) is an elliptical muscle whose fibers lie between the skin and mucous membrane of the upper and lower lips. The fibers composing the muscle are largely forward prolongations of the buccinator muscles; mingled with these are fibers from the zygomaticus, caninus, quadratus labii superioris, triangularis, quadratus labii inferioris, and risorius. The muscle possesses some slight attachment to skeletal structures by three groups of fibers which have sometimes been regarded as distinct muscles: the incisivi labii superioris which arise from the incisive fossae of the maxillae and pass downward and outward to mingle with the other fibers of the orbicularis at the angles of the mouth; the incisivi labii inferioris which arise from the alveolar border of the mandible beneath the canine teeth and also unite with the orbicularis at the angles of the mouth; and the depressor septi, composed of the uppermost fibers of the orbicularis which bend upward from

either side in the median line and are inserted into the lower margin of the septal cartilage of the nose. The main action of the orbicularis is to bring the lips together; if its action is continued, it will press the lips against the teeth. The more peripheral fibers of the muscle, aided by the incisive bundles, tend to protrude the lips.

2. The *nasalis* muscle (Fig. 9) arises from the maxilla in close association with the superior incisive bundles just described. The medial fibers are inserted into the alar cartilage of the nose while the lateral ones extend forward over the ala of the nose to terminate upon its dorsal aspect in a thin aponeurosis which serves to unite it with its fellow of the opposite side. The medial fibers draw the alar cartilage downward and inward while the lateral ones slightly depress the tip of the nose and, at the same time, compress the nostril.

3. The *infraorbital head* of the *quadratus labii superioris* (Fig. 9) arises from that portion of the maxilla which forms the infraorbital margin. It extends almost vertically downward to join the orbicularis oris and to be inserted into the skin of the upper lip with the insertions of the angular and zygomatic heads of the quadratus and with the caninus. It acts in conjunction with the other two heads of the quadratus to elevate the upper lip.

4. The *caninus* (Fig. 9) arises from the canine fossa on the anterior surface of the maxilla and inserts into the skin at the angle of the mouth, partly intermingling with the fibers of the triangularis. Its action is elevation of the angle of the mouth.

5. The *risorius* (Fig. 9) has a broad origin from the fascia covering the parotid gland and the masseter muscle. Its fibers converge anteriorly and insert into the orbicularis oris, intermingling with the fibers of the triangularis. The action of the muscle is to draw the angle of the mouth outward.

6. The *triangularis* (Fig. 9) originates from the outer surface of the body of the mandible and partly from the skin in that region and inserts into the skin at the angle of the mouth, also mingling with the fibers of the caninus, risorius, and orbicularis oris. It draws the angle of the mouth downward and slightly outward, giving an expression of sorrow.

7. The *buccinator* muscle (Fig. 9) has a rather extensive origin. Posteriorly it comes from the hamular process of the medial pterygoid lamina and from the pterygomandibular raphe which extends from the hamular process to the mandible; superiorly it arises from the outer alveolar border and tuberosity of the maxilla in the region of the molar teeth; inferiorly it comes from the outer border of the alveolar process of the mandible as far forward as the premolar teeth. From this origin the fibers are directed forward to become continuous with those of the orbicularis oris; they are also partly inserted into the integument of the lips. The buccinator draws the angle of the mouth laterally, pressing the lips against the teeth. When the vestibule of the mouth is distended, the muscle compresses the distending content, thus playing an important part in mastication.

The innervation of the muscles described in the foregoing should, perhaps, be briefly summarized. The four main muscles of mastication, the external and internal pterygoids, the temporalis, and the masseter, are supplied by the masticator nerve which contains the motor fibers of the fifth nerve and leaves the

cranial cavity through the foramen ovale, in company with the mandibular root of the semilunar ganglion. The mylohyoid and the anterior belly of the digastric are supplied by the mylohyoid branch of the fifth nerve. The posterior belly of the digastric is supplied by a branch of the facial nerve. The geniohyoid muscle is supplied by the descendens cervicalis (hypoglossi) as is the thyrohyoid. All the other infrahyoid muscles are supplied by the ansa cervicalis (hypoglossi) which is formed by the union of the descendens and communicans cervicalis nerves. All the platysma muscles, both superficial and deep, are supplied by the facial nerve.

CONCLUSION

Since all the muscles of the face have only one skeletal attachment, usually the origin, it seems improbable, from a purely anatomic standpoint, that any one muscle should be able to mold the dental arches to any appreciable extent. There are, however, certain combinations of actions which may exert pressure upon the arches and, conceivably, if continued long enough or if repeated at frequent intervals, might alter the contours of the maxilla and mandible, to some extent.

The combined action of the two buccinator muscles or of the two risorius muscles, or of all four, certainly forces the orbicularis oris backward against the teeth and alveolar processes. The triangularis, acting in conjunction with the superior incisive bundles of the orbicularis, should exert a downward and backward action on the anterior alveolar process of the maxilla.

Many other such combinations might be worked out; however, they go beyond the scope of this discussion as set out in the opening paragraph.

I take this opportunity to gratefully acknowledge the able assistance of Mr. Earl Gardell who prepared the illustrations.

REFERENCES

1. Piersol: Human Anatomy, Vol. 2, 2104 pages, 1936, Philadelphia, J. B. Lippincott.
2. Gray: Anatomy of the Human Body, Vol. 1, 1381 pages, 1936, Philadelphia, Lea and Febiger.
3. Brodie, Allan G.: On the Growth Pattern of the Human Head From the Third Month to the Eighth Year of Life, Am. J. Anat. **68**: 209, 1941.
4. McDowell, R. M.: The Use of Lateral Head Radiographs for Evaluating Orthodontic Results as Distinguished From Growth Changes. I. Technique and Statement of Problem, Am. J. Orthodontics and Oral Surg. **27**: 59, 1941.

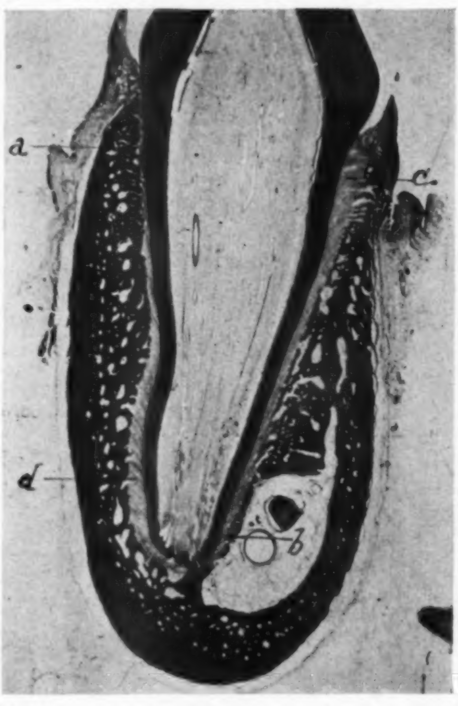
SOME HISTOLOGIC FACTS USEFUL IN ORTHODONTIC PRACTICE

BERNHARD GOTTLIEB, DALLAS, TEXAS

THERE are some histologic findings which might be useful for the practitioner in orthodontics. It might be of advantage to be able to picture what is taking place histologically during any phase of orthodontic treatment particularly if the problem be new or unfamiliar. Such a possibility might help, sometimes, to reduce the number of miracles which are so often encountered.

We all know that the ideal result of any orthodontic movement is the compression of the periodontal membrane in the direction of pressure just to the extent that the connective tissue is induced to resorb bone. A corresponding situation may be seen in Fig. 1. At *a* and *b* we have the diagonally situated area of pressure and at *d* and *c* the areas of traction. If we do not compress the

Fig. 1.



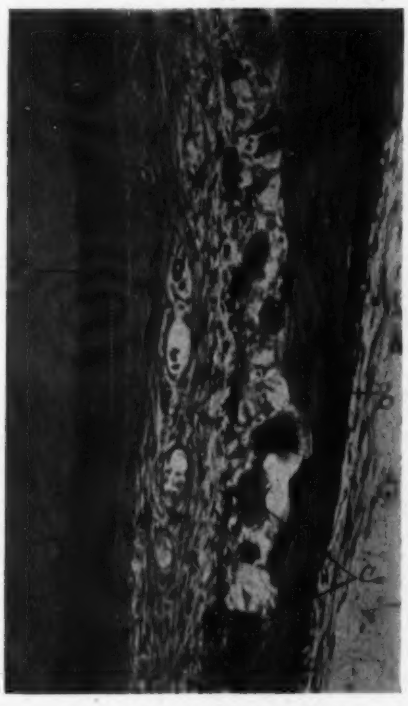


Fig. 2.

Fig. 1.—The situation of a tooth which has been moved to the left. The periodontal membrane at the alveolar margin, *a*, has been more compressed than diagonally at the apex, *b*. The same is true at the places of traction. The periodontal membrane at *c* is thicker than at *d*.

Fig. 2.—Frontal resorption. The periodontal membrane is gently compressed between tooth, *a*, and bone, *b*. The result is the resorption of bone while the tooth surface remains intact. *c*, Giant cells resorbing bone.

periodontal membrane too much, then a *frontal resorption* of bone results. In Fig. 2 we see such a frontal resorption of bone while the opposite tooth surface remains intact. We have the impression that under normal conditions some protective measures save the tooth from being resorbed.

From the Department of Oral Pathology and Dental Research, Baylor University, College of Dentistry.

Read before the Great Lakes Society of Orthodontists in Ann Arbor, Nov. 4, 1941.

But if the force increases in relation to the existing periodontal fibers, a contact between tooth and bone develops. Fig. 3 shows such a contact at the alveolar margin. The fixation at the apex is stronger than that at the alveolar margin. Therefore, we may expect contact at the latter location sooner than at the apex. Fig. 4 shows a higher magnification of such a contact between tooth and bone. The periodontal membrane of that area is compressed and necrotic.

Fig. 3.

Fig. 4.

Fig. 3.—The tooth has been moved with relatively greater stress than in Fig. 1. Contact has been achieved between tooth and alveolar bone at the right alveolar margin, *a*. Diagonally at the apex, *b*, no contact; the apex being better fixed resists more.

Fig. 4.—Periodontal membrane between tooth, *a*, and bone, *b*, compressed and necrotized. On the walls of the three neighboring marrow spaces, *c*, beginning resorption.

Here we are confronted with the question: Does such a thing depend on the apparatus used or on the skill of the orthodontist? To a large extent it is independent of both. Let us analyze an orthodontic treatment right from the beginning. First, an adequate force is inserted. Frontal resorption then takes place at the bone to some extent. The patient returns for the second adjustment. Let us assume that the same force has been used as was used the first time. That force is now bound to be relatively excessive. The bone has been resorbed to a certain extent because of the first adjustment. The periodontal fibers inserted in these resorbed places have been put out of function by the destruction of one wall of their fixation. The second adjustment finds the fibers decreased in number quite a bit. Let us say 20 per cent less than the original number are now present. If the same force as was used the first time is applied to the new situation, it must be too strong. We might find that, at the second adjustment, we already have contact between tooth and bone.

It is probably true that very few orthodontic treatments are completed without having produced such a contact at least once. There is a chance that some clinical evidence may be available from which we may discover if such a con-

tact has been reached. I can imagine that the notoriously skillful fingers of many orthodontists may be able to feel some hard resistance in attempting to move a tooth, thus making the diagnosis of contact.

The question arises as to what happens if such a contact is produced. Is it bound to produce damage? Not at all. It depends entirely upon the further action of the orthodontist. The following figures may show what happens after the periodontal membrane has been compressed. In Fig. 5 we see a compressed but not necrotic periodontal membrane. The compressed connective tissue is merely unable to perform any more resorption. The degree of compression has a maximum center decreasing toward the periphery. At some point of that periphery the compression decreases to a degree where the connective tissue is able again to resorb.

Fig. 5.

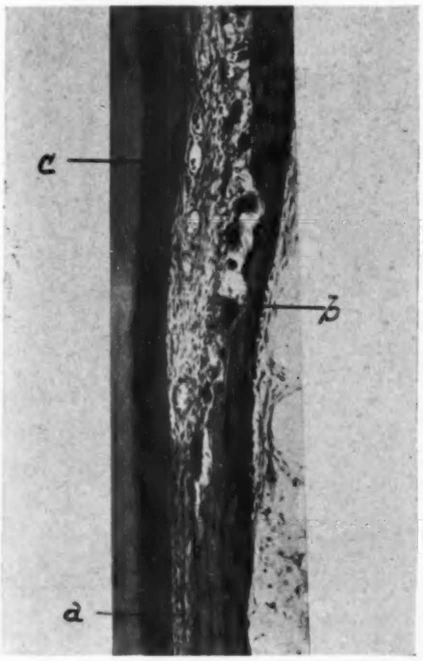


Fig. 6.

Fig. 5.—Periodontal membrane, *a*, compressed but not necrotized. Beginning rear resorption, *b*, at adjoining part which has been less compressed. Tooth surface, *c*, intact.

Fig. 6.—At *a* periodontal membrane compressed and necrotized. Here resorption is not possible. Beginning rear resorption at *b*. Tooth surface, *c*, intact.

At this perimeter the resorption of the compressed area starts in and resorbs the whole bone at the center from the rear and not from the periodontal membrane. Therefore we call it *rear resorption* in contrast to frontal resorption which takes place at the front of the periodontal membrane.

In Fig. 6, we see a compressed area where the connective tissue does not show any nuclei. We are confronted with a necrosis. On both sides of the necrosis we see rear resorption started. In Fig. 7 the rear resorption of the bone which could not become resorbed from the front is nearly finished. Only a small piece of bone is still in contact with the necotic tissue. Fig. 8 shows the necrotic tissue quite freed and separated from the bone. The resorption at the bone is still active, but the periodontal membrane shows quite healthy connective

tissue already. The situation is nearly repaired. Nature takes care of the necrotic tissue that cannot be cleaned away.

We have in Figs. 2, 5, 6, 7, and 8, different stages of bone resorption with the opposite tooth surface remaining intact. We know that sometimes we have tooth resorption. Here we may ask again if such a result depends on the method

Fig. 7.

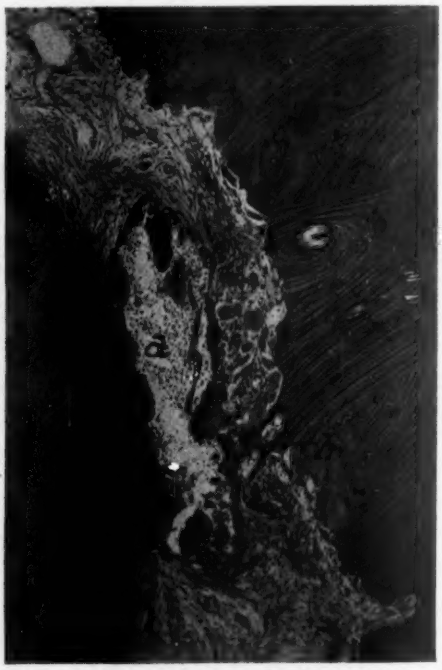


Fig. 8.

Fig. 7.—Necrotized periodontal membrane, *a*, almost freed by rear resorption. Only a small piece of bone, *b*, still in contact with the necrotic area.

Fig. 8.—Necrotized periodontal membrane, *a*, entirely freed by rear resorption. Giant cells, *b*, still on the bone surface. Tooth surface, *c*, intact.

Fig. 9.—At *a* nearly symmetrical resorptions of tooth and bone as reaction on pressure.

of treatment or on the skill of the particular orthodontist. We may state generally that the young people whom we treat orthodontically, for the most part, are highly resistant to tooth resorption. However, it seems that tooth resorption may occur here and there. It seems that treatment carried out over a period of many years is unfavorable, making more severe tooth resorption possible.

We have another indication from the statistics of the New York University department of orthodontics. From these statistics we find that there is apparently more tooth resorption in the teeth of the maxilla than in those of the mandible. It is probable that the explanation for this may be found in the use of intermaxillary ligatures. Whereas the teeth in the maxilla have to bear the whole of the intermaxillary force, it is possible for this force to be divided in the mandible. A part of the force may go to the joint and collum, thus taking a part of the burden from the periodontal membrane. If that explanation is true, we have an indication that smaller forces are less apt to make tooth resorption than larger forces.

Fig. 10.

Fig. 11.

Fig. 10.—Two teeth pressing connective tissue against each other make symmetrical resorption, *a*.

Fig. 11.—Higher magnification of the symmetrical resorption from Fig. 10. The resorption is repaired.

Fig. 9 may be helpful in bringing out a better understanding of tooth resorption. We have seen many instances of bone resorption with an intact tooth surface opposite. In Fig. 9 we see a nearly symmetrical resorption of bone and tooth of a dog. In the case of human teeth it sometimes happens that the roots come nearer to each other. Having removed at first the bony septum between the teeth, the teeth themselves compress the connective tissue between them. The connective tissue answers in most cases with symmetrical resorption on both teeth concerned. In Fig. 10 we see such a case and in Fig. 11, a higher magni-

fication. A symmetrical resorption took place with repair stabilizing the situation. Probably no further movement was caused. Thus it seems that the tooth surface offers more resistance to resorption than the bone, and we expect generally that compressed connective tissue may answer with bone resorption only or mainly.

If our treatment caused tooth resorption, and we wait until a repair layer of cementum takes place with reconstruction of the periodontal connection with the bone, then we may go ahead with the movement. Fig. 12 shows tooth resorption with a very thin cementum coating of repair and formation of periodontal connection with the opposite bone. In such a case, we feel that new movement may be permitted.

Fig. 12.

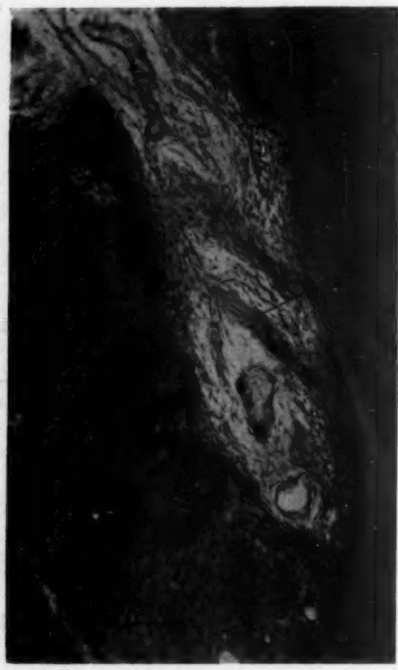


Fig. 13.

Fig. 12.—Tooth resorption, *a*, repaired by a thin new cementum coat. New periodontal fibers, *b*, connect the tooth surface with bone.

Fig. 13.—Bone, *a*, is united with tooth, *b*.

If we have tooth resorption and proceed with the movement in spite of the fact that the resorbed tooth area has not yet been coated with a new cementum layer, an ankylosis with the alveolar bone may develop. Fig. 13 shows such an ankylosis in a dog's tooth which has been moved. If such an ankylosis develops and it is strong enough, any further movement of the tooth is impossible.

I have tried to enumerate several histologic findings which might be of interest in orthodontic practice.

ALTERING THE OVERBITE

A Model Study of Two Adult Cases

Ashley E. Howes, D.D.S., New Rochelle, N. Y.

THE first case, Fig. 1, is that of a young man 26 years old. The case was started by Dr. Floyd Gibbin of Buffalo in October, 1937, and when the patient came to me in September, 1938, a large part of the work had been accomplished. If the treatment of this case is entitled to any commendation, it should go to Dr. Gibbin. Condemnation I shall be glad to share with him. It was Dr. Gibbin who decided that the case could be improved by orthodontic treatment, and as I said before, much of the work had been accomplished when the young man came to me. At that time he was wearing a mandibular lingual arch with auxiliary springs against the incisors, a maxillary labial arch, and an upper removable vulcanite bite plane. The plane was built flat where the anterior teeth struck it, not being sloped to force the mandible forward. The maxillary central incisors had been moved labially and were slightly depressed by means of ligatures to the labial arch. The mandibular anterior teeth had been rounded out,

Fig. 1.

and almost enough space had been created for the right cuspid. The posterior mandibular teeth on the right side had been moved somewhat distally by this treatment, so that the intermaxillary relations on that side were not quite as good as in the original model. I therefore placed a new maxillary labial arch with a coil spring on the right side to drive the maxillary right molar distally by means of an intermaxillary elastic on that side. I also banded the maxillary right cuspid and lateral incisors, as well as the mandibular right central, in order to rotate these teeth, and correct their axial inclinations.

Read before the New York Society of Orthodontists, Nov. 10, 1941.

The second set of models, Fig. 2, shows an overbite rather on the shallow side, and the rest of the teeth in good occlusion. These models were made in February, 1939, at which time the young man informed me he was being married and wanted treatment discontinued. Had this not occurred I might have continued to correct the mesial inclination of the maxillary right cuspid, but perhaps it is just as well that he got married. I placed no retention on the maxillary arch, except a band on the maxillary right lateral incisor to hold the rotation accomplished. In the mandibular arch I placed a skeleton vitalium plate to hold the length of the arch. Fig. 3 shows a comparison of the models. Fig. 4 shows the lingual views of the models. I saw this patient again the following September, and no change had taken place. I realize very little, if anything instructive, can be gotten from this case because of its scanty records. His last appointment, which was made for the purpose of taking a complete set of radiographs, was broken. The original radiographs taken by Dr. Gibbin showed no abnormalities. It would have been interesting to see if any absorption of the apices of the anterior teeth took place, and I shall some day be able to get this record. In my own defense, I can say that when I accepted the invitation to present these two cases, I was confident of being able to obtain a further record of this case. However, when I called the patient's mother (the young man in the meantime had gone to live in New Jersey), I was surprised to find that he was serving in a technical capacity with the R.A.F. in England. I wrote him there, and gave him instructions for taking a labial bite of his own teeth, which I hoped he could mail to me.

Fig. 2.

The second case is that of a young man 32 years of age. As you will notice in Fig. 5 there is an excessive overbite, considerable crowding of the mandibular anterior teeth, slight distal relationship on the left side, and on the right side a maxillary second premolar has been removed allowing mesial migration of the three molars on that side. At the age of twenty the patient received a blow on

the mandible, and he said it was diagnosed as a fractured jaw although no radiographs were taken, and no splinting was done. This is rather confusing, but in any event, after that time he had considerable trouble in mastication, as his jaws had a tendency to lock. He informed me that during one such state of trismus, he fainted in a restaurant from the pain.

His temporomandibular joints always cracked badly upon opening. It was for this reason, and the fact that he was dissatisfied with his appearance, that he went to the general dentist to see what could be done about his teeth. When the young man smiled, his upper lip line was well above the gingival margins of the maxillary incisors. The dentist told him that his central incisors could be shortened by cutting them down and placing jackets on them, but he would prefer to have the case treated orthodontically if it were possible. I was rather pessimistic in my discussion of the case with the patient, explaining fully the possibilities of failure. My diagnosis of the case was that the maxillary incisors were in supraversion, that is, according to Lischer's terminology, below their normal level of occlusion. I think the posterior teeth were in slight infraversion. If this were true, the vertical dimension of the face would have to be increased in order to correct it. I do not know if it is possible to accomplish this in an adult patient.

Fig. 3.

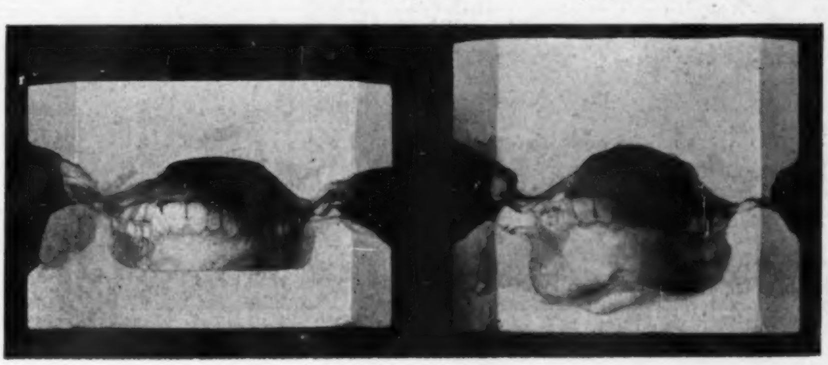


Fig. 4.

I do not know the etiology of the case. It could have had some predisposing cause complicated by a local factor during the development of the denture, or it could have been produced by a local factor alone, possibly abnormal muscular pressure. In treating the case, I assumed that if the anterior teeth were moved to a more nearly normal functional relationship the original forces which produced the deformity would no longer predominate. If such forces do still predominate, the case is naturally doomed to failure.

Fig. 5.

Fig. 6.

Originally I banded the maxillary first molars, and the central incisors, and placed a 0.020 stainless steel labial arch with large loops in front of the molar

tubes to give it great flexibility. This arch rested in tie-brackets on the central bands. It was adjusted upward about one mm. every six weeks to depress or intrude the centrals. I stress this point of the extremely mild force because you will see in the radiographs taken later that there has been some root absorption of the maxillary anterior teeth. Bear in mind that the labial arch used to depress these teeth was only 0.020 in. in diameter, that it had large loops in front of the molar tubes in order to increase its flexibility, and that the ends of the arch rested in 0.036 tubes and not tubes which exactly fitted the arch. The mesial inclination of the first molars was taken advantage of in depressing these central incisors. A mandibular lingual arch was placed with 0.014 stainless steel

Fig. 7.

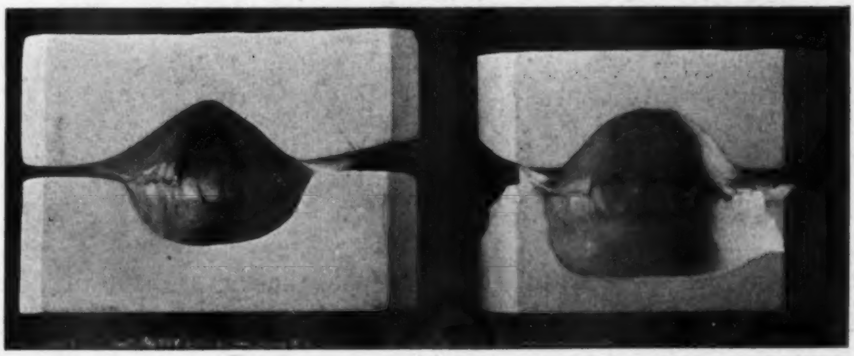


Fig. 8.

springs to move the mandibular anterior teeth forward as the maxillary incisors were moved outward and upward. At the end of nine months, a removable vulcanite bite plane was placed in the maxillary arch, opening the bite two mm., and a twenty gauge labial arch was placed. This arch had sliding intermaxillary hooks with coil springs behind them, the object being to move the maxillary molars distally by means of intermaxillary force. A mandibular twin wire arch was placed, and the six anterior teeth ligated to it. At the end of a little more

than a year from starting treatment, bands with tie-brackets were also placed on the maxillary lateral incisors, and incisal extensions were added to the labial arch in order to get root movement and rotations of the maxillary anterior teeth.

The entire active treatment extended over a period of three years. As the posterior teeth came together, a new plate was placed, separating them about a millimeter. Three new plates were placed during the treatment. The cracking in the temporomandibular joints continued intermittently. No definite conclusions could be deducted clinically concerning the cracking, as on one occasion it occurred when a new plate was placed to open the bite still farther, while the placing of the last plate which held the posterior teeth about one mm. apart stopped the cracking for awhile. At the end of three years retainers were placed. The jaw cracks sometimes when he opens it, and sometimes it does not. In this respect the patient says he is a great deal more comfortable than before treatment was started. Perhaps this can be improved by grinding after the retainers have been worn for some time. Fig. 6 shows the case as it is at the present time. Fig. 7 shows a comparison of the models. Note change in the mesiodistal relationship on the left side. Fig. 8 shows the lingual views of the models. Fig. 9 shows the radiographs of the anterior teeth of the case after treatment.

Fig. 9.

You will notice from the title of this report that an attempt has been made to avoid controversy over just what was accomplished in these cases. There will be no time for discussion anyway, but had I titled the report "Increasing the vertical dimension in two adult cases," many men would have felt it necessary to object. There are no definite conclusions that can be drawn from these cases, except that in one of them the treatment produced some root resorption of the anterior teeth. What the after effects of this injury will be, only time will tell. This, of course, is also true of the tooth movements. I believe that a number of years must elapse after all retention is removed before we can decide what benefit or harm has resulted from this treatment.

650 MAIN STREET

Department of Orthodontic Abstracts and Reviews

Edited by

Dr. J. A. Salzmann, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Postnatal Development of the Head: By Charles Benedict Davenport, *Proceedings of the American Philosophical Society* **83**: Pp. 215, Price $1.50, Philadelphia, The American Philosophical Society, Independence Square, 1940.

Postnatal growth of the head in length, according to Davenport, was found to increase from 4.5 cm. at the end of the fifth calendar month of intrauterine life, to 12 cm. at birth, or at a rate of 195 mm. per annum. After birth, Davenport found the rate of growth to diminish as follows:

	MM.	RATE PER ANNUM
Birth to ½ yr.	25.0	50.0
½ yr. to 1 yr.	10.0	20.0
1 yr. to 2 yr.	10.0	10.0
2 yr. to 3 yr.	3.8	3.8
3 yr. to 5 yr.	3.4	1.7
5 yr. to 16 yr.	14.0	1.3

Calling the adult head length 190 mm. then the fraction of the adult size attained at various ages, according to Davenport, is as follows:

	PER CENT		PER CENT
Birth	63	3 years	89
End 6th. month	76	5 years	91
1 year	82	10 years	95
2 years	87	15 years	98

Postnatal growth of the head in width, beginning in the mid-gestational period at 45 mm. increases with great rapidity to 94 mm. at birth and to 100 mm. during the first postnatal month. Davenport found the slope of the curve to diminish slowly during the first postnatal year. At the end of twelve months the mean width of the male head is about 131 mm.; at 2 years 140 mm., and after that head width undergoes little change—about 5 mm. from 7 to 14 years, or 0.7 mm. per annum.

Amount of Growth of Head Width in mm. Per Annum

Prenatal	100.0 mm. p. a.
0-6 mo.	50.0 mm. p. a.
6 mo.-12 mo.	20.0 mm. p. a.
1 yr.-2 yr.	9.0 mm. p. a.
2 yr.-3 yr.	1.5 mm. p. a.
3 yr.-14 yr.	0.5 mm. p. a.

The amount of growth of head width is at first about the same as that of head length, but after two years it slows up greatly. The early cessation of growth in head width is considered by Davenport to be associated with the slowing up of increase in brain width.

The head height in Davenport's study is the distance, perpendicular to the Frankfort horizontal, of the vertex of the head from the upper lining of the external auditory meatus. The head height increases only slowly before birth and after three years post partum almost none at all. The head height is always less in the female than the male, but the two sexes approach quite closely at about 10 years in connection with the female spurt of growth.

Bizygomatic width increases very rapidly during prenatal development; slows up temporarily at four to five years; thereafter proceeds with increased gradient. It is less in girls than boys except at 12 years.

The bigonial width increases less rapidly, prenatally, than does the bizygomatic width; during juvenility growth is slow; there is an adolescent spurt in growth. The curve of the female lies in general below that of the male except that the two coincide at age 8 or 10 years.

Horizontal length of the postauricular region grows from 18 mm. in a fetus of the fourth month to 97 mm. in the adult.

The distance from occiput to tragion is subject to marked changes during development corresponding to changes in the dimensions of the brain. There is rapid increase to the end of the first postnatal year, when the mean of this dimension has attained 82 per cent of the mean adult size and over 90 per cent of its adult size at age 4 years. There is a rapid diminution of growth after age 1 year and a cessation of growth during juvenility, even diminishing a millimeter or two until about the eighth year. After age 8 years, the rate of postauricular growth begins to increase, is accelerated between 13 and 16 years, during the adolescent spurt, and diminishes again to age 18 years. The porion, at least between ages 10 to 16 years, generally shifts its position with reference to the *sella turcica* which is relatively stable with reference to other parts of the cranium. The cessation of growth of the postauricular portion of head length is in part due to a backward migration of the external auditory meatus.

Cephalic Index.—This ratio of $\frac{\text{head width}}{\text{head length}}$ is the most commonly determined head ratio. The different sizes of the cephalic index are grouped for convenience under three heads, defined by Martin as follows:

Dolichocephaly	x-75.9
Mesocephaly	76.0-80.9
Brachycephaly	81.0-x

The head of the newborn, born with vertex presentation, is rendered temporarily more brachycephalic. But quickly the genetic form is restored. The form of the head, and of the brain, which must in early infancy largely determine that of the cranium, depends primarily upon genetic growth factors, but the course of growth may be influenced by birth distortions (usually for only a few days) and by gravity (if it is allowed to work chiefly in one direction). The influence of these two factors is usually temporary although it is possible

that the experimental modification of head proportions during the first 6 to 9 months may result in their slight permanent modification. Finally, artificial deformation of the head, as practiced by various peoples during many months of infancy and childhood, may lead to permanent gross deformation, changing the child's cephalic index.

The cephalic index, percentage ratio of head width by length, after decreasing during the latter part of gestation to a low point of narrowness rebounds after birth, often through 10 points. However, after 6 to 12 months the head begins to become more dolichocephalic again.

The decrease of the height-width ratio before birth may be a temporary adjustment of the birth process by keeping the cranium low, thus facilitating the standard (lambdaparietal) presentation. Immediately after birth this ratio of the head rebounds, as it were, to a form which is determined by the interaction of heredity and environment. Of the latter the most obvious factors are pressures by gravity acting on the head as the child lies in bed. These, whether applied at occiput or laterally, would tend to cause an extension of the axis of the head perpendicular to the line of pressure; i.e., to an increase in height. After 7 postnatal months the baby begins to sit up more or less and at 10 months to stand. Now, gravity acts along the vertex-basion axis of the cranium and this tends to depress the plastic brain and its largely membranous case and causes the case to expand laterally. This, the period around 10 months, is one with a reduced head ratio. But, again, as the cranial bones come to replace the membranes and to harden, the effects of gravity are diminished and during the following months the genetic factors become more efficient and more largely control the form of the head, especially making it more compact, narrower, and higher. After 3 years the head tends to become relatively wider, perhaps influenced by the pull of the jaw and neck muscles. And this change is more marked in boys than girls, perhaps because they use the muscles for harder work. Finally, an adolescence sets in with the spurt of growth, the vertical dimensions, even of the head, become like the vertical dimensions of other organs, increased more than transverse ones.

The head is divided into cranial and visceral portions. All the facial bones below the upper margin of the orbits down to and including the lower jaw we may regard as visceral. The changes in the visceral part of the face with age are much greater than those of the cranium, as may be seen by comparing the face of an infant and an adult.

The physiognomic face height (from the hair line on the forehead [trichion] to the gnathion) is found to develop, like head height, rapidly to about 10 months postnatal, and then to slow up, probably partly on account of gravity's action of the skull.

Morphologic face height is the distance from nasion to chin angle (gnathion). The morphologic face height increases rapidly until the child stands; more slowly thereafter and less rapidly in girls than boys. The individual curves show an adolescent spurt of growth, doubtless associated also with the development of the molar teeth.

Nasion to stomion is approximately that part of morphologic face height from which the lower jaw height has been subtracted. The upper landmark is the

nasion; the lower landmark is the slit between the lips when the mouth is gently closed.

In the male for two months after birth the growth continues at the same rate as before birth, but at the end of that time the rate gradually diminishes down to 2.5 mm. per annum at around 2 years. After 3 years occurs a fairly steady slope of about 2 mm. per annum to 8 years and then of 1.1 mm. per annum to 15 years when 70 mm. is reached.

The curves of the sexes become differentiated shortly after birth. That of the girls lies from one to three millimeters below that of boys during 7 years from age 6 to age 13 when the curves approach to within a millimeter, and thereafter diverge slightly to stand about 3 to 5 mm. apart at maturity.

Stomion to gnathion is the height of the lower face. The curve of the lower face lengths of the females is probably constantly about 1 mm. below that of the males.

The lower face height increases during the first two years postnatally, as the deciduous dentition is about to erupt; grows slowly during childhood, advances rapidly as adolescence sets in. It shows great individual variation in growth, producing the marked variation in lower jaw development of the adult. The growth of this dimension seems associated with that of the body as a whole.

At birth the visceral part of the head is less well developed than the cerebral part. If, as has been suggested, the precocious development of the brain is necessary in order that the enormously complicated organ should be, at the time of birth, ready to begin to function and to perfect its functioning as early as possible, this demand is not so insistent in the case of the visceral part of the face. Here the functions are relatively simple: the support of the sense organs and the teeth and structures for the attachment of muscles used in the expression of the emotions and for sucking and chewing.

Morphologic to Physiognomic Face Height: In the male the percentage ratio of growth of morphologic face height (nasion to gnathion) as compared to physiognomic face height (trichion to gnathion) advances with some irregularities from about 59 per cent at birth to 67 per cent. The female curve advances from 58½ at birth to 65 per cent. During the first year there is an extraordinarily rapid drop in ratio of two points. By the end of the first year the ratio is back at the birth level and then advances very slowly to about 7 years, and then more rapidly for a time. The curve for males of proportional lower face height rises strikingly after 7 years in sigmoid fashion, the inflection standing at about 9 years. By 16 years the curve has become asymptotic to 67 per cent, which is about the maximum mean ratio.

From 2 to 7 years the curve of the female ratios lies about ½ a point below that of the male. It ceases to rise from 8 to 11 years and then starts upward again about 4 to 3 points below the male curve, becoming asymptotic at 64 per cent. Apparently the female has a disproportionately small morphologic face height.

Segments of the Morphologic Face Height.—The morphological height of the face may be divided into three segments which together equal 100. These are: nasion to *subnasale* (or nasal height), gnathion to stomion (or lower

jaw), and *subnasale* to stomion (the upper lip, including the alveolar process of the maxilla). In the male, beginning during the latter half of gestation, the lower jaw increases; the nose decreases, while the upper lip increases. After the eruption of the deciduous dentition, the proportions of the face undergo few marked changes until age four years when the jaws again seem to grow at the expense of the nasal height, as the development of the permanent incisors proceeds. After 6 years the development of nasal height is predominating except at 11 to 12 years when the permanent canine and the premolars are erupting. Also, at the pubescent spurt of growth, the lower jaw height increases and the "prominent chin" of maturity makes its appearance, while the nose height is relatively stabilized.

The curve of proportional height of segments of the face of girls runs very close to that of boys. The proportional chin height of girls seems slightly less than that of boys, and the nose is correspondingly larger, after adolescence.

Changes in proportion of the three segments of the morphologic face height are closely bound up with enlargements of the maxillary sinus, alveoli, and teeth. Boys have proportionally slightly higher chins than girls. There are marked individual differences in proportional chin height.

Taking height in relation to width, the face is seen to be becoming relatively lower and wider during 2 or 3 months preceding birth. Immediately after birth the height of the face increases greatly and rapidly during the first year. Then in boys it seems to flatten out. This is probably because of the action of gravity on the skull during the period of "first steps." During the third year the ratio advances rapidly again in boys and becomes nearly stabilized at about 5 years.

In girls the age changes during the first 3 postpartum years are quite different from those in boys. This is associated with the sexual differences in physiognomic face height and with the remarkable differences in the morphologic face height/bizygomatic width ratio. Girls do not show the period from 1 to 2½ years of slight change that boys do. After 5 years the course of change in girls is like that in boys. The age curve of girls lies a point or so below that of boys from 5 to 10 years.

Width of the cranium is practically completed at age three years, although cranial length growth continues after this age at a greatly reduced rate. The vertical dimension of the head is greatly modified by the pull of gravity directly upon the brain and on its plastic brain-case. This depression of the brain tends to increase cranial maximal width, and especially frontal width. There is a cessation of growth in cranial height and width and postauricular cranial growth during late childhood.

The growth curves of vertical *dimensions of the face* are far more irregular than those of the cranium and are probably due in part to the action of gravity, but more to the numerous and relatively large changes that are taking place in the bones of the face as follows:

1. Enlargement of the maxillary sinus from a space 5.5 mm. high × 4.6 mm. wide × 13.3 mm. long at birth, to one 25 × 21 × 35 mm. at about 17 years.
2. The development of the sphenoidal sinus at the base of the cranium plays a part in the forward protrusion of the face. It increases from a cavity 2.8 mm. × 2.0 mm. ×

1.6 mm. at birth to one 20.0 mm. × 20.0 mm. × 25.0 mm. at 17 years. By its development the face must be pushed forward by a good part of an inch.

3. Development of the alveolar part of the maxilla and the mandible; first as the deciduous dentition develops and later as the permanent dentition erupts and the molars come into play, there is an addition to the length of the jaw of from 25 to 35 mm.
4. In response to the pull of the masticatory muscles the zygomatic arch and body of the mandible become enlarged.

The skull at birth is so plastic that it is easily distorted temporarily. As the baby begins to walk, the head height diminishes and width increases somewhat correspondingly; but the genetically determined head form soon asserts itself. There is evidence that prenatally the form of the cranium adapts itself to the prospective cross sectional form of the birth canal and hence is brachycephalic. After birth and reconstruction the cranium elongates and dolichocephaly (if the genes for dolichocephaly be present) is gradually established.

The curves of head ratios involving head height are irregular in middle infancy because of the deformation of head height through the action of gravity.

The relation of the dimensions of the horizontal segments of the head to total head length is complicated by the migration of the ear capsule and its external meatus. In infancy the proportion of the postauricular segment tends to increase rapidly; then diminish to about 10 years and then to increase slowly during adolescence and up to 19 years or older. The infant at birth has a relatively small postauricular segment and resembles in this respect the anthropoid apes.

The transverse frontal index decreases rapidly to 4 years as the head increases in width over the ears. After that there is a more rapid increase of forehead width than maximum head width bringing about the typical human broad forehead from the relatively narrow, anthropoid condition. Facial form has undergone a vast number of mutations in the faces of mankind; it shows a vast number of familial differentiae. Among them are height of nose, of upper lip, of lower jaw and chin. The height of the face is increased strikingly at the time of the adolescent spurt of growth.

The mean nose height decreases rapidly proportionally prenatally, but from birth on increases to around 43 per cent of morphologic face height. The mean lower jaw increases proportionally prenatally, decreases a little (perhaps) during the first postnatal year and, with some irregularities, increases slightly (about 1 per cent) to maturity when it is 38 per cent of morphologic face height. The mean upper lip tends to decrease proportionally from birth (at 22 per cent) to 15 years when it is 18 per cent of morphologic face height. Thus, the vertical nose dimension increases at the expense of the upper lip.

The mean distance between the pupils of the eyes of course increases as the head enlarges, but relatively to the bizygomatic width of face the eyes approach (except perhaps for a period from 5 to 9 years). The mean angle between the eye pupils, whose apex is at the interporial line, decreases from about 51 degrees at mid-gestation to 41 degrees at 9 or 10 years and thereafter seems to increase slightly. Thus the eyes which are laid down probably over 160° apart have not completed their relative migration toward each other until adolescence begins.

Since the female sex has, on the average, a smaller body than the male, it is found that all of the mean absolute head dimensions are smaller in girls than boys.

The head, although apparently resistant to deformation in the adult, is in fact a highly plastic organ. It is subjected, and responsive, to external conditions, prenatally as well as postnatally—in the uterus, during parturition, in bed during infancy, through the first months of standing, during childhood in consequence of activities.

A part of the changes in the general form of the head and especially of the face are the mechanical result of development and increase of special organs. Such, e.g., are the teeth and alveolar processes, the maxillary sinus and the thickening and sinus formation occurring in the glabellar region.

The adult living head shows itself as the product of both environmental and genetic factors, and the genetic factors are both old and new or recent; and between them there is, as it were, a struggle during development, the new factors coming into function later and having the most influence on the details of the final human form as contrasted with the anthropoid form.

The Newer Nutrition in Pediatric Practice: By I. Newton Kugelmass, B.S., M.A., M.D., Ph.D., Sc.D., Attending Pediatrician, Broad Street Hospital and Heckscher Institute, New York; Consulting Pediatrician, Lynn Memorial Hospital, Monmouth Memorial Hospital and Muhlenberg Hospital, New Jersey. Formerly: Visiting Pediatrician, French Hospital and New York City Children's Hospital; Director Pediatric Research, Fifth Avenue Hospital and Pediatric Research Associate, Yale University. Pp. 1155, 183 illustrations, Price $10.00, Philadelphia, J. B. Lippincott Co., 1940.

Kugelmass has correlated nutritional knowledge to the entire field of clinical pediatrics. The book is divided into three sections. Section One deals with nutritional physiology and includes consideration of the nutritional basis of growth and energy metabolism. Protein, carbohydrate, fat, vitamin, and mineral metabolism are discussed. Section Two deals with nutrition in health and Section Three is devoted to nutrition in disease.

"Hygiene," says Kugelmass, "is unrelated to caries susceptibility, but affects the course of the disease, particularly when the lesions occur on the axial surface of teeth." The author believes that dietary deficiencies during pregnancies are more likely to affect the mother than the fetus, but that both suffer from certain vitamin and mineral inadequacies. The mineral content of the infant's teeth is more deficient when the mother's diet lacks calcium and vitamins A and D than when the diet is lacking in calcium alone. Detailed information is provided relative to the effects of various mineral and vitamin deficiencies of the teeth and development of the jaws. Even when the diet is perfect, the teeth may still be carious because of digestive, adsorptive, or systemic disturbances. Essential tooth constituents may be brought by the blood stream to the teeth and still be unused. Hence, that which is absorbed and utilized, rather than that which is offered, is significant in resistance to caries, Kugelmass points out.

Various oral diseases and their respective etiologies are described. Tables are provided on diets for the purpose of aiding in the establishment of caries-free mouths.

Although the title of the book implies that it deals with the application of nutrition in pediatric practice, extensive discussion is provided on practically all diseases and infections to which children are prone. Diseases of the mouth are discussed and methods of feeding in the presence of various oral malformations are provided. Nutritional deficiencies, according to the author, invariably affect the gingival tissues. He advocates hygiene of the mouth as the first requisite to permit proper food intake.

Many valuable tables and a detailed index are provided, which makes for a ready reference.

J. A. S.

Editorials

Prevention

The Selective Service examinations have centered public attention on the need of a better dental program. It is commendable that organized dentistry has stressed better dentistry, but this does not solve the problem of dentistry as a public health measure. We should admit that this problem has not been approached properly, nor will it be solved successfully unless a "long view" plan is formulated and followed. Never in the past has the dental profession, of which orthodontics is an integral part, been confronted with a more serious situation than at present.

Dentistry has made great progress, but the public is not concerned with methods, and in the light of present knowledge feels that we have failed to get the job done. In most states we have secured laws which are designed to protect the public from the dental quack, but our real intentions have not been understood generally or fully appreciated by the public or the press.

We should take "stock" and realize that panel dentistry, greater service to the masses and underprivileged, and lack of better dental health are all a result of a lack of understanding of the cost of dental care. We know that under present methods, conditions, and personnel, a majority of practitioners, except those whose patients are in the upper brackets, are underpaid for services rendered. The forty-hour week and greater volume will not improve the situation materially.

We must realize that the greatest progress of the medical profession has not been the "cure" of disease, but rather through a greater effort to prevent disease, while dental progress is evidenced by restoring and correcting dental defects, rather than a removal or limitation of causes.

The principal aid toward solution of the problem is prevention. This requires a changed viewpoint of a majority of the profession regarding the practice of "dentistry for children." The present method of handling children results in it being more expensive than any dental service rendered adult patients. A recent editorial in this JOURNAL aptly pointed out one definite cause of lack of proper early care. An equal or greater hindrance to early dental care is due to the fact that the first visit to the family dentist is usually for the relief of pain, or for a service that causes pain. Time is therefore needlessly wasted, and time is the only thing the dentist has to sell. Several visits of only a few moments' duration before the advent of pain not only save many future hours, but also provide the most appreciative patients in any practice. Reduced costs of dental care can be attained only through a saving in operative time.

Never before have we had the value of good dental health so universally called to the attention of the public, where its importance will be given serious consideration. This publicity is something we could not buy. If we stand idly

by and admit inability to cope with the situation, the awakened, progressive element of the laity will take charge. Prevention of much of the present condition is certainly possible. The remedy for past neglect cannot be produced now by any sleight of hand magic; however, similar conditions in the future may be avoided or materially minimized by concerted action of the profession, both individually and collectively. If we have the vision to see, a constructive preventive service can and should be the most lucrative part of any practice.

P. G. S.

Booklet for Laymen

The Rocky Mountain Society of Orthodontists has recently published a booklet for lay consumption, pertaining to the subject of orthodontic treatment. It was obviously felt by the members of the Rocky Mountain Society of Orthodontists that such a booklet would assist in educating new patients in some of the essentials of cooperation during orthodontic treatment. No doubt at least a part of the inspiration responsible for the publication of the booklet was that it would serve the purpose in addition to the above, of making patients and parents orthodontic conscious. That is to say, that in reading the booklet there would result a realization at the time treatment started, that all orthodontists must enjoy close cooperation, otherwise their efforts for successful correction may be a hopeless task.

The preface to the booklet states:

"Through years of sharing scientific procedures and comparing data, we, the members of the Rocky Mountain Society of Orthodontists, and many of our colleagues in other sections of the United States, have agreed that greater progress and better results are possible when there exists a thorough understanding between the orthodontist and his patient.

"To this end, we have prepared the information contained in this little booklet. We ask that you read it thoughtfully and keep it for frequent reference."

The subjects taken up in the booklet are as follows:

Defining Orthodontic Treatment
Selecting Your Orthodontist
Advantages of Orthodontic Treatment
Orthodontia, a Cooperative Process
Construction of Appliances
Cleanliness and Safety are Synonymous
Keeping Appointments
A Precaution
Explanations Over the Telephone
Sticky Candy
Lost Appliances

Intermaxillary Elastics
Some Financial Considerations
Illness
Extracurricular Activities
Diet and Orthodontic Treatment
Conclusion.

Through its secretary, the Rocky Mountain Society of Orthodontists points out that the booklet has not been published for the purpose of advertising orthodontics, but to create a more enlightened clientele in order that relations with patients may be simplified.

While there, no doubt, will be great difference of opinion as to what should and should not be contained in such a booklet for the purpose in hand, notwithstanding the booklet is sightly, compact, comprehensive, new, and well organized. The booklet carries the sponsorship of the Rocky Mountain Society of Orthodontists. Orthodontists who may wish to secure additional information may address Miss Ethel Covington, Secretary, 700 Majestic Building, Denver, Colo.

H. C. P.

Dental Health

A new periodical which devotes its pages to the general subject of dental health has made its debut.

Dental Health is the bulletin of The National Dental Hygiene Association, and Volume 1, Number One of this journal was mailed in February, 1942.

Dental Health is published quarterly at 934 Shoreham Building, Washington, D. C., by the National Dental Hygiene Association, an independent, nonprofit organization, as part of its program for the advancement of dental health for the American people.

The leading article in the first issue, on the subject of dental health needs, was written by Lieutenant Commander C. Raymond Wells, USNR, Chief Dental Officer, National Headquarters, Selective Service System, Washington, D. C. Wells points out that approximately 188,000 selectees were rejected for military service because of dental defects. The great number of rejections has been a means of emphasizing to the general public this lack of physical preparedness. It is helping to emphasize to the people and to the public-health minded people and agencies that man power is our greatest waste, and the waste of man power is a luxury which we cannot afford either during war or peace.

Thus the above reflects the importance of the subject of dental health in general.

The editor of the new periodical is Randolph G. Bishop, and the editorial board consists of Mrs. J. E. Bush, Frank C. Cady, D.D.S., Anna C. Gring, R.N., and N. P. Neilson, Ph.D. Officers of the National Dental Hygiene Association that sponsors the new periodical are: James J. Morgan, President, Maximin D. Touart, M.D., Vice-President, Paul E. Morgan, Treasurer, and Randolph G. Bishop, Secretary.

Special Report

MINUTES OF THE MEETING OF THE PUBLIC RELATIONS
BUREAU OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS
HELD AT COLUMBIA UNIVERSITY CLUB, DEC. 15, 1941

Those present were: Chairman Nicolai, Mr. Anderson, Doctors Barber, Salzmann, Eby, Young, Keller, Riesner, and Hillyer.

The Board heard with deep sorrow of the death of Mrs. Waugh, wife of our beloved fellow worker, Dr. Leuman Waugh. It was unanimously voted that a suitable message be sent to Dr. Waugh.

Mr. Anderson gave the financial report as of Dec. 1.

Dr. Young moved that the president of the American Association of Orthodontists be requested to ask the presidents of the Sectional Societies to appoint committees to take up the matter of intensive local programs, these committees to meet in March, 1942, during the New Orleans meeting. This was seconded by Dr. Barber, and passed.

The minutes of the meeting of Oct. 21 were read and, with one correction, were approved.

Dr. Nicolai reported that as the American Board of Orthodontics did not approve the article by Dr. Dunn for the purpose intended by the Board this matter be dropped.

Dr. Nicolai also reported the receipt of a letter from the Department of Labor, Washington, D. C., requesting six extra copies of Dr. McCoy's article. These copies have been sent. The Dental Division of the National Selective Service Headquarters reports the McCoy release most helpful to them.

The Board unanimously approved that it ask the President of the American Association of Orthodontists to recommend an increase of $5.00 per year in dues for the future work of the Board, which feels very strongly that the reserve should not be further drawn upon. All funds so received, above the amount of $2500.00 which shall be appropriated for the budget of the Board, are to be returned for the purpose of recouping the reserve fund.

Dr. Barber moved that the following mailings be authorized by the Board:

1. A bulletin on radio talks to be mailed to the membership,

2. Reprints of articles from *Life and Health* magazine and *Physical Culture* magazine to be mailed to the membership.

This was seconded by Dr. Young and passed.

There being no further business, the meeting adjourned at 11:15 P.M.

Respectfully submitted,

NORMAN L. HILLYER, Secretary.

1 EAST 57TH STREET,
NEW YORK, N. Y.

News and Notes

American Association of Orthodontists

A letter recently sent to the members of the American Association of Orthodontists by the President of the Association, Dr. Claude Wood, reads as follows:

To the Members of the A. A. of O. and Guests:

It is a privilege to announce perfection of plans for the first Inter-American Orthodontic Congress. Communications have been sent to representatives in each of the twenty Latin American Republics inviting them to represent their countries in the Congress to be held at the time of the American meeting in New Orleans, March 16.

Arrangements have been made whereby these men are invited as complimentary guests of the Association. We are indeed fortunate to be the first professional group to sponsor such an inter-American relationship.

The Program Committee of the A. A. of O. has arranged an excellent program, which has gone to press; and which will be sent to you soon. We would like to refer you to the February number of the AMERICAN JOURNAL OF ORTHODONTICS for further details.

The Local Arrangement Committee under the capable leadership of A. C. Broussard, S. D. Gore, J. A. Gorman, and George Crozat has made plans for your pleasure during the meeting. New Orleans is at its best in the middle of March, and for those who have never had the pleasure of being there at that time of the year, a real treat is in store. It will be such a relief to many of you to see beautiful flowers in full bloom and spring everywhere. It is a meeting that the wives especially will enjoy, and one that will not be overcrowded with scientific sessions. We hope you will enjoy the evenings with old and new friends, as New Orleanians like to see people enjoy life. The annual Spring Fiesta will be at its height. As one member expressed it in a letter just received: "I am going to try to pay the first installment on my income tax (and, thank God, the figures are across instead of up and down), and then I am coming to New Orleans if I have to borrow the money. I am going to enjoy this meeting when I get there and forget war and taxes, for perhaps it will be the last one I will attend for a long time; because when the meeting is over I am coming home and join the Army or stay close and work like h - - -. But first, I want to celebrate with a few old friends. Furthermore, don't put any darn board meetings and such in the evenings, because I won't attend."

That, to me, is the spirit of '42, for it expresses my hopes to you. Let's start making preparations for March 15, and join this man of '42. We will try to have everything ready for your convenience.

Looking forward to seeing you, I remain

Yours sincerely,

Claude,

CRW/mm CLAUDE R. WOOD, President.

P. S.—Allow me to suggest that you make your hotel reservations *EARLY AND DIRECT* with the Roosevelt. Let me warn you to make your railroad or air reservations early, both going and returning. This is very essential.

The Inter-American Meeting

The foremost orthodontists in the Latin American countries are expected to attend the New Orleans meeting of the American Association of Orthodontists in March. Even at this early date (February, 1942), many have signified their intention of being present to collaborate in this first Inter-American meeting. Some of those who have indicated they expect to attend are the following:

Mexico: Samuel Fastlicht, Mexico City
Guatemala: Alfredo A. Morales, Guatemala
Salvador: J. Benjamin Zavaleta, San Salvador
Nicaragua: Fernando Fuentes, Managua
Costa Rica: Roberto Chartier, San José
Panama: Manuel M. Diaz, Panama City
Colombia: Alberto G. Botero, Bogotá
Venezuela: Jose Araujo Carillo, Caracas
Ecuador: Emique Ritalda, Quito
Brazil: Virgilio Moojen de Oliveira, Rio de Janeiro
Peru: Ricardo Salazar, Lima
Bolivia: Jaime Zamorano, La Paz
Paraguay: Rodolfo Pagano, Asunción
Uruguay: Oscar Aldecoa, Montevideo
Chile: Louis de la Carrera, Santiago
Argentina: Dr. Armando Monti, Buenos Aires
Cuba: Sergio Giquel, Havana
Haiti: Jules Thebaud, Haiti
Honduras: Alberto A. Smith, Tegucitalpa

A large attendance from the United States and the rest of North America is also expected.

The Dentist in the Draft

The Preparedness Committee of the American Dental Association has been exerting every effort to prevent the indiscriminate induction of dentists into the Army as privates. This has not been done in a spirit of attempting to assist any man to avoid service to his country, but instead the attempt is made only to insure a full use of the limited dental resources of the country.

Since the declaration of war many local draft boards have shown an inclination to draft dentists into the service without any thought as to the necessity for the conservation of the professional man power of the nation.

Through the organization of the Procurement and Assignment Service, by order of President Roosevelt, a way has been at last provided to utilize in a proper manner the professional services in the nation. This Service is now undergoing its organization, but time must be allowed for this organization to take place.

In this interim many draft boards have shown no tendency to await the organization of the new Service, and as a result many dentists are now being classified in Class 1A.

From Major Sam F. Seeley, Executive Officer of the Procurement and Assignment Service Board, has come the announcement of the steps which should be taken to prevent induction of a dentist as a private and thus save the dentists for professional use after the Procurement and Assignment Service becomes operative.

First, a dendist who is classified in Class 1A should request deferment from induction on the basis of the formation of the Procurement and Assignment Service, an explanation of which will be found on page 2057 of the December, 1941, issue and page 117 of the January, 1942, issue of the *Journal of the American Dental Association.* If this deferment is denied, then the dentist should utilize every agency for appeal which is available under the existing law.

Next, if the appeal made to the local board is denied, the dentist should then direct a communication to the State Director of Selective Service of the state in which the dentist is registered under Selective Service. This communication should set out the details of the case and request action on the deferment on the basis given above.

Finally, if the State Director of Selective Service does not act, a communication should be directed to Brig. Gen. Lewis B. Hershey, National Headquarters, Selective Service System, Washington, D. C., and in this communication the details of the case should again be stated. A copy of this letter should be sent to the Procurement andAssignment Service at Room 5654, Social Security Building, Washington, D. C.

It must be borne in mind that this is not a means by which a dentist may avoid service. It is only a means to avoid the waste of scarce human resources and will only serve to defer a man until such time as the Procurement and Assignment Service will call upon the man for his services in a professional capacity.

New York Society of Orthodontists

The program of the New York Society of Orthodontists was held Feb. 23 and 24, 1942, at the Waldorf-Astoria Hotel, New York City.

The formal program given was as follows:

"Report of Case Treated With the Johnson Twin-Arch Appliance," Clare K. Madden, D.D.S., Greenwich, Conn.

"Diagnosis in Orthodontics: Theory and Practice," J. A. Salzmann, D.D.S., New York, N. Y.

"Morphology and Behavior," Arnold Gesell, M.D., Director of the Clinic of Child Development, School of Medicine, Yale University, New Haven, Conn.

Report from the American Board of Orthodontics, Frederic T. Murlless, Jr., D.D.S., Vice-President American Board of Orthodontics, Hartford, Conn.

President's address

"Photography," Douglas F. Winnek, Mt. Vernon, N. Y.

"Review of Tissue Changes during Movement of the Teeth," Charles F. Bodecker, D.D.S., F.A.C.D., Professor of Dentistry (Oral Histology), School of Dental and Oral Surgery, Columbia University, New York, N. Y.

Clinics:

1. Supplementing Paper,
   Wm. M. Rogers, Ph.D., and S. L. Katz, D.D.S.
2. Flasking Acrylic Resins,
   Fred F. Schudy, D.D.S., assisted by Axel Hanson
3. Max J. Futterman, D.D.S.,
   "The Twin-Arch Lengthener"
   "Stainless Steel Electrolytic Polisher"
4. Supplementing Case Report,
   Douglas F. Winnek
5. Supplementing Paper,
   Harry W. Perkins, D.M.D., F.A.C.D.

Selective Educational Clinics:
Chromium Steel Technique,
Archie B. Brusse, D.D.S., Denver, Colo.
The Johnson Twin-Arch Appliance,
Henry U. Barber, Jr., D.D.S., New York, N. Y.
The Angle Edgewise Arch Appliance,
Robert H. W. Strang, D.D.S., Bridgeport, Conn.
(The men giving these clinics were aided by assistants)

Case Report: "Acrylics," Fred F. Schudy, D.D.S., Postgraduate Student, Columbia University, College of Dentistry, New York, N. Y.

"Biodynamics of the Temporomandibular Joint," Wm. M. Rogers, Ph.D., Department of Anatomy, College of Physicians and Surgeons, Columbia University, New York, N. Y., and S. L. Katz, D.D.S., Department of Orthodontia, School of Dental and Oral Surgery, Columbia University, New York, N. Y.

"The Rehabilitation of Children With Cleft Plate, Harelip, or Both," Harry W. Perkins, D.M.D., Orthodontist at Children's Hospital, Boston, Mass., and Edward I. Silver, D.M.D., Asst. Orthodontist at Children's Hospital, Boston, Mass.

"Retention," Bercu Fischer, D.D.S., New York, N. Y.

The meeting of the New York Society was conducted under the leadership of President Sidney R. Riesner.

New York University College of Dentistry Anniversary

To commemorate the seventy-fifth anniversary of the founding of the New York University College of Dentistry a dinner will be held at the Waldorf-Astoria Hotel, Thursday evening, March 19, and an alumni day program of scientific interest will be held March 20, at the College of Dentistry, 209 East 23rd Street, New York City.

Edward H. Angle Society of Orthodontia

Because of world conditions the thirteenth biennial meeting of the Edward H. Angle Society of Orthodontia, originally announced for March 25 to 31, will be postponed until some future date.

Ontario Dental Association

The Seventy-Fifth Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, Ont., May 18 to 21, 1942. Dentists from the United States and all parts of Canada are welcome.

American Board of Orthodontics

The 1942 meeting of the American Board of Orthodontics will be held at the Roosevelt Hotel, New Orleans, La., March 14, 15, and 16. Orthodontists who may desire to be certified by the Board may obtain application blanks from the Secretary, Dr. Bernard G. deVries, 705 Medical Arts Bldg., Minneapolis, Minn.

Cleveland Dental Society

The annual spring Clinic Meeting of the Cleveland Dental Society will be held May 4 to 6, 1942, at the Statler Hotel, Cleveland, Ohio.

Southern Society of Orthodontists

The next annual meeting of the Southern Society of Orthodontists will be held in conjunction with that of the American Association of Orthodontists in New Orleans on March 16 to 19, inclusive. There will be no scientific program arranged separately so that members can attend the meetings of the American. There will, however, be a short business meeting sometime during the sessions, details of which will be announced later.

E. C. LUNSFORD, Secretary.

Medical and Surgical Relief Committee of America

Dr. Malcom W. Carr of 52 East 61st Street, New York City, was unanimously elected chairman of the New York State Division of the National Dental Committee recently organized to cooperate with the Medical and Surgical Relief Committee of America. The election was held at a meeting at national headquarters, 420 Lexington Avenue, New York City, Feb. 13, 1942.

For its first task the new group will undertake to obtain a quantity of dental supplies requested by Dr. Reidar Sognnaes of the Royal Norwegian Forces to complete twelve dental units now being prepared for shipment overseas.

Dr. Elmer S. Best of Minneapolis, Minn., is chairman of the National Dental Committee.

Notes of Interest

Dr. J. M. Loughridge announces the removal of his offices to Rooms 301-303 Medico-Dental Bldg., Sacramento, Calif. Practice limited to orthodontics.

Dr. Milton Scott Tucker announces the removal of his office to 147-15 Sanford Avenue, Flushing, N. Y. Practice limited to orthodontics.

Dr. W. Frank Wilson announces that in the future he will devote all of his time to his practice of orthodontics in Mansfield, Ohio, at 602 Richland Trust Bldg.

OFFICERS OF ORTHODONTIC SOCIETIES*

American Association of Orthodontists

President, Claude R. Wood - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Secretary-Treasurer, Max E. Ernst - - - 1250 Lowry Medical Arts Bldg., St. Paul, Minn.
Public Relations Bureau Director, Dwight Anderson
- - - - - - - - - - - - - - - - - 292 Madison Ave., New York, N. Y.

Central Association of Orthodontists

President, Harold J. Noyes - - - - - - - - - - 55 E. Washington St., Chicago, Ill.
Secretary-Treasurer, L. B. Higley - - - - - - - - 705 Summit Ave., Iowa City, Iowa

Great Lakes Society of Orthodontists

President, Henry D. Cossitt - - - - - - - - - - 942 Nicholas Bldg., Toledo, Ohio
Secretary-Treasurer, C. Edward Martinek - - - - - - - 660 Fisher Bldg., Detroit, Mich.

New York Society of Orthodontists

President, Sidney E. Riesner - - - - - - - - - - - 136 E. 36th St., New York, N. Y.
Secretary-Treasurer, William C. Keller - - - - 40 E. Forty-Ninth St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, Ben L. Reese - - - - - - - - - - - - Roosevelt Bldg., Los Angeles, Calif.
Secretary-Treasurer, Earl F. Lussier - - - - - - 450 Sutter St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, George H. Siersma - - - - - - - - - -1232 Republic Bldg., Denver, Colo.
Secretary-Treasurer, Curtis L. Benight - - - - - - - 1001 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, W. P. Wood, Jr. - - - - - - - - - - - 442 W. Lafayette St., Tampa, Fla.
Secretary-Treasurer, E. C. Lunsford - - - - - - - 2742 Biscayne Blvd., Miami, Fla.

Southwestern Society of Orthodontists

President, E. Forris Woodring - - - - - - - - - - Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer, R. E. Olson - - - - - - - - Union Nat'l Bank Bldg., Wichita, Kan.

American Board of Orthodontics

President, Charles R. Baker - - - - - - - - - - - - 636 Church St., Evanston, Ill.
Vice-President, Frederic T. Murlless, Jr. - - - - - 43 Farmington Ave., Hartford, Conn.
Secretary, Bernard G. DeVries - - - - - - - - - Medical Arts Bldg., Minneapolis, Minn.
Treasurer, Oliver W. White - - - - - - - - - 213 David Whitney Bldg., Detroit, Mich.
William E. Flesher - - - - - 806 Medical Arts Bldg., Oklahoma City, Okla.
James D. McCoy - - - - - - - - - 3839 Wilshire Blvd., Los Angeles, Calif.
Joseph D. Eby - - - - - - - - - - - - 121 E. 60th St., New York, N. Y.

Harvard Society of Orthodontists

President, Harold J. Nice - - - - - - - - - - 475 Commonwealth Ave., Boston, Mass.
Secretary-Treasurer, Edward I. Silver - - - - - - - - - 80 Boylston St., Boston, Mass.

Washington-Baltimore Society of Orthodontists

President, Paul W. Hoffman - - - - - - - - 1835 Eye St., N. W., Washington, D. C.
Secretary-Treasurer, Stephen C. Hopkins - - - - - - 1726 Eye St., Washington, D. C.

Foreign Societies†

British Society for the Study of Orthodontics

President, S. A. Riddett
Secretary, R. Cutler
Treasurer, Harold Chapman

*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.

At the Pan-American Meeting of the American Association of Orthodontists in New Orleans

(Upper row, left to right) Dr. Virgilio Moojen de Oliveira, Brazil, Professor of Orthodontics at the Dental School of Rio de Janiero; Brigadier General Leigh C. Fairbank, Head of the United States Army Dental Corps; Dr. Oren A. Oliver, President of the American Dental Association; Dr. Claude R. Wood, President of the American Association of Orthodontists.

(Lower row, left to right) Dr. Rodolfo Pagano of Paraguay; Dr. Horacio Read, Dean of the Dental School of the Dominican Republic; Dr. Oscar Aldecoa, Uruguay, Professor of Orthodontics at the University of Montevideo.

A complete picture of the Pan-American guests will be published in a subsequent issue.